

UC/DAVIS

1976-77

General Catalog

**University of
California
Davis**

UCD AT A GLANCE

Founding Year	1905
Location	15 miles west of Sacramento, 72 miles northeast of San Francisco. Adjacent to the city of Davis (population 33,000).
Area	3,800 acres
Enrollment (1975-76)	Undergraduate—12,559 Graduate—3,057 Health Sciences—1,615
Faculty and Staff	1,300 teaching faculty 6,000 staff
Colleges, Schools, and Divisions	College of Agricultural and Environmental Sciences College of Engineering College of Letters and Science Graduate Division School of Law School of Medicine School of Veterinary Medicine Division of Extended Learning
Degrees Offered	A.B., B.S., M.A., M.A.T., M.Ed., M. Engr., M.F.A., M.H.S., Cand. Phil., Ph.D., D. Engr., J.D., M.D., D.V.M., M.P.V.M.
Library Collection	1,310,000 volumes 39,000 periodicals received annually
Fees (1976-77)	California Resident: Undergraduate, \$212.50 per quarter Graduate, \$223.50 per quarter Nonresident: Undergraduate, \$847.50 per quarter Graduate, \$858.50 per quarter
Nickname	Cal Aggies
Colors	Blue and Gold
Address	University of California, Davis, California 95616
Telephone	(916) 752-1011

UC/Davis

**General Catalog
1976-77**

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Information herein is subject to revision.

Price \$1.50; \$2.00 by mail (see page 315 for ordering information).

It is the responsibility of the individual student to become familiar with the announcements and regulations of the University printed in this catalog, the *Class Schedule and Room Directory*, and on Official Notices posted on bulletin boards.

As required by Title IX of the Education Amendments of 1972 (45 CFR 86), the University of California does not discriminate on the basis of sex in admission to or employment in the educational programs and activities which it operates. Inquiries concerning Title IX may be directed to:

Vice Chancellor—Academic Affairs, 515 Mrak Hall, 752-2072; Vice Chancellor—Student Affairs, 541 Mrak Hall, 752-2417; or Director, Office of Civil Rights, Department of Health, Education and Welfare.

About the catalog:

The cover for this year's catalog was selected from designs submitted by students in Design 133, Graphic Communication Design. The artist, Jan Gloystein, is a senior majoring in Design.

The quotes used in this catalog were chosen as representative of the opinions of UC Davis students, faculty, and friends, and were collected by John M. Knox, a senior in the Department of Rhetoric.

UC/Davis

General Catalog 1976-77



HOW TO USE THIS CATALOG

The General Catalog is meant to be the primary source of information about University policy, procedures, and campus services. While the Catalog attempts to cover all aspects of the University and to answer as many of your questions as possible, you will probably find that there are areas in which you would like more detailed information. Therefore, throughout the book references are made to other publications available from individual offices or departments. There is also a list of major publications, their prices, and where you can get them on page 315.

You probably will find yourself going back to the Catalog throughout the year, to answer new questions and refer to important policies. This publication will be one of the handiest tools you'll have, because if the answer isn't here, the Catalog can direct you to the right place to find it.

The Catalog is divided into four major sections:

- Information about the University, admission, student services, registration, and degree requirements
- Information about individual colleges and schools
- Descriptions of specific courses of study (majors), their requirements, and classes offered
- Appendices and Index

The Correspondence Directory on the inside back cover provides a list of the most frequently used offices and their addresses. For other office or department addresses, refer to the index. A glossary of unfamiliar terms is found on page 316. You may find it helpful to look over the glossary before reading the sections on admission, registration, and degree requirements.

Although every effort has been made to keep this Catalog correct and current, there inevitably will be some changes in courses offered, instructors assigned, etc. each quarter. Students should therefore check supplementary publications (especially the *Class Schedule and Room Directory*) for the most up-to-date information.

Perhaps the most important question this Catalog attempts to answer is: What does UCD offer to help me reach my goals? Two problems usually arise in attempting to answer this question: the name of the major best suited to your objectives may not be the name that you have associated with that objective; and the diversity of administrative units within the University may baffle the uninitiated. For example, a person interested in dealing with people in social contexts may think to look under Sociology in the College of Letters and Science, but may completely overlook additional programs and courses under headings such as Applied Behavioral Sciences or Agrarian Studies in the College of Agricultural and Environmental Sciences.

The best way to begin investigating your area of interest is to refer to the Majors and Courses section of the Catalog. This listing provides information about each major, the requirements involved, and the courses offered. If you are still in doubt as to the college, major, or program that best fits your needs, you might choose a course that seems most pertinent to your interests and write for further advice to the instructor listed as teaching that course. Department chairpersons, committee chairpersons, and advisers are other good sources of assistance.

To get a feeling of what the Davis campus is like, and what it can offer you both inside and outside the classroom, you should read the front section of the Catalog. Then, if you choose, request application materials and begin the admissions process.

CONTENTS

Chancellor's Message	7
Calendar	8
Academic Calendar, 8	
Academic and Administrative Holidays, 8	
Candidates for Degrees, 8	
Admission Deadlines, 9	
Financial Aid Deadlines, 9	
Introduction	11
The University of California, 11	
UCD's History, 12	
The Setting, 13	
The City of Davis, 14	
Campus Life, 14	
The Davis Campus Today, 15	
The University Library, 16	
Organized Research Units, 17	
Additional Academic Programs, 20	
Division of Extended Learning, 20	
Program for Part-Time Degree Students, 20	
University Extension, 21	
Summer Sessions, 21	
Committee for Arts and Lectures (CAL), 21	
Conferences and Campus Services, 21	
Education Abroad, 22	
Work-Learn, 22	
University Professors, 23	
Student Life	25
Living Accommodations, 25	
Recreational Facilities and Programs, 26	
Associated Students (ASUCD), 27	
Student Organizations and Activities, 28	
Advising and Counseling, 28	
Student Services, 30	
Student Health, 30	
International Student Services, 31	
Services to Handicapped Students, 31	
Veterans Affairs, 32	
Women's Resources and Research Center, 32	
Student Employment, 33	
Career Planning and Placement, 33	
Cal Aggie Alumni Organization, 33	
Fees, Expenses, and Financial Aid	35
Fees and Expenses, 35	
Financial Aid, 36	
Scholarships and Awards, 38	
Admission	41
Visiting the Campus, 41	
Explanation of Application Categories, 41	
Undergraduate Studies, 42	
Entrance Requirements, 42	
Admission as a Freshman, 42	
Admission to Advanced Standing, 44	
Special Programs and Admission Categories, 45	
Educational Opportunity Program (EOP), 45	
Second Baccalaureate, 45	
Limited Status, 46	
Special Status, 46	
Intercampus Transfer, 46	
Applicants from Other Countries, 46	
Concurrent Courses, 47	
Application Procedures, 47	
Additional Information, 48	
High School Proficiency Examination, 48	
Subject A Requirement, 48	
Advanced Placement Examinations, 49	
CLEP, 49	
Credit From Another College, 49	
Admissions Checklist, 49	
Academic Information	51
When You Arrive, 51	
Registration Procedures, 51	
Fee Refunds, 53	
Scholastic Requirements, 53	
Grading, 54	
Examinations, 56	
Transcripts, 56	
Class Level, 56	
Probation and Disqualification, 57	
CEEB Advanced Placement Examinations, 58	
Student Responsibility, 59	
Honors and Prizes, 59	
Bachelor's Degree Requirements, 60	
College of Agricultural and Environmental Sciences	63
College of Engineering	71
College of Letters and Science	87
Graduate Division	101
Professional School Requirements and Preparation	109
School of Law	115
School of Medicine	121
School of Veterinary Medicine	125
Majors and Courses	129
Explanatory Note, 129	
Key to Footnote Symbols, 132	
Major Programs and Courses of Instruction, 133	
Appendix	311
Statement of Legal Residence, 311	
Disclosure of Public Records, 313	
Salary and Employment Information, 314	
Publications, 315	
Glossary, 316	
Administrative Officers, 318	
Index	320
Campus Map	327
Correspondence Directory (inside back cover)	





Dear Friends and Members of the UCD Community,

The present edition of the UCD General Catalog has, I am happy to say, been completely redesigned and rewritten. The attractive new format is intended not only to please the eye but also to make it easier for you to find information quickly and to be able to read about our campus in language that is clear, concise, and informal.

Revision of the Catalog was begun in response to a report prepared by the Academic Senate's Special Committee on the Catalog, chaired by Professor Robert Laben. Administrative responsibility for seeing the project through was delegated to Professor Michael J. Hoffman, Assistant Vice Chancellor—Academic Affairs. He has had extensive cooperation and consultation with a great many people on the campus, particularly with Connie Kearns of the Publications Office who coordinated the project and handled the editing, design, and production. I should like to thank all the individuals and units on the campus who joined in this collaborative effort.

It is our hope that the new Catalog will help all the friends and members of the UCD community to understand the campus a little better. It is our special hope that the new Catalog will help students to make more informed decisions about educational matters. Because we also want the Catalog to be continuously useful, I am inviting you to address any comments and suggestions you might have about this new edition to the Publications Office, University of California, Davis.

I wish you all success for the 1976-77 academic year.

James H. Meyer
Chancellor

CALENDAR

FALL 1976

WINTER 1977

SPRING 1977

FALL 1977

Academic Calendar*

• Pick up registration and course enrollment materials from the Registrar's Office (all continuing students).	June 2-Sept. 10	Nov. 17-19	Feb 23-25
• Advisers available to all students (except Engineering).	June 3-4	Nov. 18-19	Feb. 24-25
• Advisers available to all Engineering students.	June 3-4	Nov. 22-23	Feb. 28-Mar. 1
• Turn in course enrollment materials (all continuing students).	Aug. 2-Sept. 1	Nov. 22-23	Feb. 28-Mar. 1
• Turn in Registration Packets and Fee Payments (all continuing students).	Aug. 2-Sept. 10	Nov. 22-Dec. 10	Feb. 28-Mar. 11
• Late Registration for continuing students.	Sept. 11-Oct. 15	Dec. 11-Jan. 18	Mar. 12-April 15
• Quarter begins.	Mon., Sept. 27	Mon., Jan. 3	Thurs., Mar. 31
• Orientation and testing.	Sept. 27-Oct. 1	Jan. 3-4	Mar. 31-April 1
• In-person registration and payment of fees.	Sept. 29	Jan. 3	March 31
• Instruction begins.	Mon., Oct. 4	Wed., Jan. 5	Mon., Apr. 4
• Last day of late registration.	Fri., Oct. 15	Tues., Jan. 18	Fri., Apr. 15
• Final date to file petitions to change status from part-time to full-time student, or vice versa.	Oct. 15	Jan. 18	April 15
• Final date to petition to add courses to study list.	Oct. 15	Jan. 18	April 15
• Final date to petition to drop courses (thereafter permission may be granted by the dean of your school or college and only under exceptional circumstances).	Fri., Nov. 5	Tues., Feb. 8	Fri., May 6
• Final date for undergraduates to file petitions with the dean of their college or school to take courses on a Passed/Not Passed basis. Exceptions rarely approved.	Nov. 5	Feb. 8	May 6
• Final date for graduate students to file petitions with the dean of the Graduate Division to take courses on a Satisfactory/Unsatisfactory basis.	Nov. 5	Feb. 8	May 6
• Final date to file Independent Study Program project proposal form (available at dean's office) either with the student's college dean or directly with Independent Study Committee.	June 2	Nov. 5, 1976	Feb. 4
• Instruction ends.	Fri., Dec. 10	Wed., Mar. 16	Thurs., June 9
• Final examinations.	Dec. 13-18	Mar. 18-24	June 11-17
• Quarter ends.	Dec. 18	March 24	June 17
• Commencement.			Mid-June

Academic and Administrative Holidays

Thurs-Fri. Nov. 25-26	Mon., Feb. 21 Mon., Mar. 28	Mon., May 30	Mon., July 4 (Summer) Mon., Sept. 5
Fri., Dec. 24			
Fri., Dec. 31			

Candidates for Degrees

Undergraduates

• Candidates who expect to complete work for A.B. and B.S. degrees must file an Announcement of Candidacy with the Registrar on or before this date.	Fri., Oct. 15	Tues., Jan. 18	Fri., Apr. 15	Fri., July 1 (for Sept. '77)
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*Dates are subject to change and should be checked with the appropriate *Class Schedule and Room Directory*.

	FALL 1976	WINTER 1977	SPRING 1977	FALL 1977
Graduate Students				
• Candidates who expect to complete work for masters' degrees must file applications for candidacy with the Dean of the Graduate Division on or before this date.	Fri., Oct. 8	Mon., Jan. 10	Fri., Apr. 8	June 27 (for Sept. '77)
• Theses for masters' degrees must be filed with the committees in charge on or before this date.	Fri., Nov. 12	Fri., Feb. 18	Fri., May 13	Aug. 5 (for Sept. '77)
• Theses for masters' degrees must be filed with the Dean of the Graduate Division on or before this date.	Fri., Dec. 17	Thurs., Mar. 24	Fri., June 17	Sept. 9 (for Sept. '77)
• Candidates who expect to complete work for the degrees of Doctor of Philosophy and Doctor of Engineering must file applications for candidacy with the Dean of the Graduate Division on or before this date.	Fri., Aug. 27	Fri., Nov. 19, 1976	Tues., Mar. 1	May 20 (for Sept. '77)
• Theses for the degrees of Doctor of Philosophy and Doctor of Engineering must be filed with the committees in charge on or before this date.	Fri., Oct. 1	Fri., Jan. 7	Fri., Apr. 1	July 1 (for Sept. '77)
• Theses for the degrees of Doctor of Philosophy and Doctor of Engineering must be filed with the Dean of the Graduate Division on or before this date.	Wed., Dec. 1	Tues., Mar. 1	Wed., June 1	Aug. 19 (for Sept. '77)

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 Admissions on or before this date.	Sunday Nov. 30, 1975	Saturday July 31, 1976	Sunday Oct. 31, 1976	Tuesday Nov. 30, 1976
• Credentials and applications for admission to graduate standing must be filed with the Dean of the Graduate Division on or before this date.	June 1	Oct. 1	Jan. 1	June 1
• Applications for admission to the School of Medicine for 1977-78 must be filed with the School on or before this date.				Nov. 1, 1976
• Applications for admission to the School of Veterinary Medicine for 1977-78 must be filed with the School on or before this date.				Nov. 1, 1976
• Applications for admission to the School of Law for 1977-78 must be filed with the School on or before this date.				March 1, 1977
• Applications for readmission to undergraduate status must be filed with the Registrar on or before this date.	Friday Aug. 13	Friday Nov. 19	Monday Feb. 14	Friday Aug. 12, 1977
• Applications for readmission to graduate status must be filed with the Registrar on or before this date.	Friday Aug. 13	Friday Nov. 19	Monday Feb. 14	Friday Aug. 12, 1977

Financial Aid Deadlines

• Applications for grants, loans, and work-study must be filed with the Financial Aid Office on or before this date.			Friday Apr. 15	
• Applications for California State Scholarships for 1977-78 must be filed with the California Student Aid Commission on or before this date.	Saturday Dec. 4			
• Applications for UCD undergraduate scholarships for 1977-78 must be filed with the Scholarship Office on or before this date.	Saturday Dec. 4			
• Applications for President's Undergraduate Fellowships for 1976-77 must be filed with the Scholarship Office on or before this date.	Friday Nov. 12			
• Applications for fellowships and graduate scholarships for 1977-78 must be filed on or before this date.				Saturday 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 about 130,600 students, almost 90% of them residents of California. Nearly one-third of the students are studying at the graduate level. UC students lead the nation as recipients of National Merit Scholarships and Woodrow Wilson Fellowships.

The University’s reputation for excellence has attracted a distinguished faculty of scholars and scientists in all fields of scholarship. The University has 14

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.

President David S. Saxon is the principal officer for the nine-campus system. Organization and 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; seven members of the Board, 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 President’s Council.

The Regents have delegated authority in academic matters to the Academic Senate of the faculty, which determines the academic policy and governs the instructional activities of the entire University. Members of the Senate include all professors and instructors who are on the permanent faculty, as well as key members of the administration.

A chancellor is the chief administrative officer for each campus. James H. Meyer, Chancellor of UC Davis, presides over a campus of 17,650 students, including about 4,500 who seek graduate and professional degrees, more than 1300 teaching faculty, and approximately 6,000 staff. The Davis Division of the Academic Senate determines for this campus the conditions for certificates and degrees (subject to the approval of The Regents) and authorizes and supervises all courses of instruction at Davis. The Associated Students of UC Davis (ASUCD) and the Graduate Student Assembly (GSA) represent the undergraduate and graduate students through their elected members.

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. The Division of Extended Learning is responsible for additional educational programs including those for part-time degree students.

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. The School of Veterinary Medicine, still the only one in the state, was established in 1946.

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.

A deserved reputation as a fine agricultural school has belonged to UCD since its beginnings. More recently, however, the reputation of the Davis campus in many other disciplines has raised Davis into the ranks of the top 50 research universities in the United States.

The quality of undergraduate instruction is a prime concern of both faculty and students 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, and the Teaching Resources Center which aids faculty members and teaching assistants with sharpening their teaching skills. *Student Viewpoint*, a student-written and -published review of classes and instructors, is compiled each year from course questionnaires completed by students.





The Setting

The Davis campus lies adjacent to the city of Davis (population 33,000), 15 miles west of Sacramento and 72 miles northeast of San Francisco. Sacramento, and 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, including a University airport. About 980 acres are devoted to the central campus, the remainder being used primarily for agricultural research.

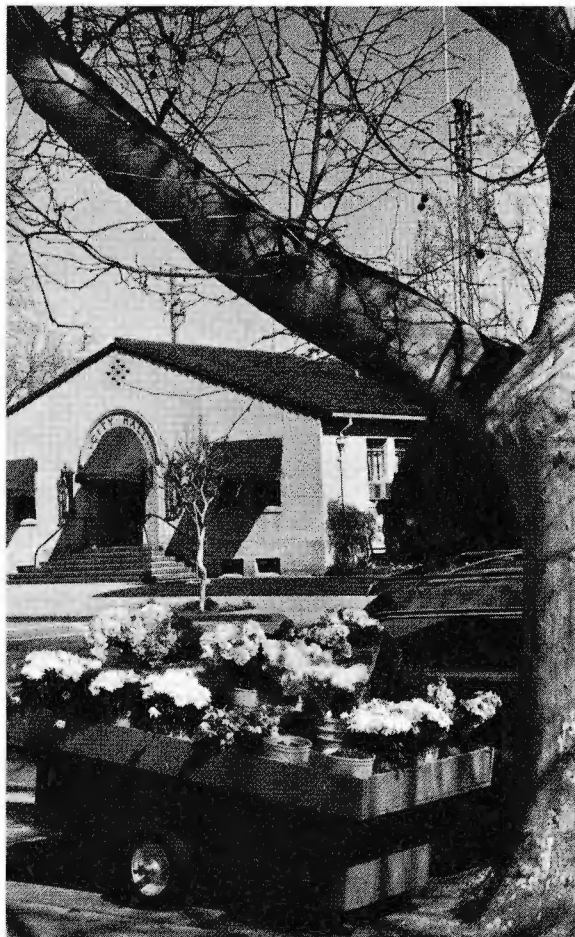
Its location makes Davis ideal for access to outdoor recreation. Within a 70-mile radius are Lake Berryessa, Folsom Lake, Clear Lake, the famed Napa Valley, and the historic Mother Lode country. A little more than an hour's drive from Davis along Interstate Highway 80 takes you to the San Francisco Bay Area. 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 will 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 26 miles of bike paths and 22,000 bicycles have given Davis the title of "City of Bicycles." Since the central UCD campus is closed to motor vehicles, the pace on campus is generally quiet and relaxed.

Automobile parking lots are located on the perimeter of the main campus. 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 Woodland and Sacramento is supplemented by Unitrans, a series of five bus lines operated by the Associated Students. Unitrans buses connect the central campus with North, East, and West Davis (the campus is adjacent to the southern end of town). A Greyhound bus terminal and an 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—in that same year the California Pacific Rail Road line was completed from Vallejo to a junction located on the former Jerome C. Davis farm, and the city of “Davisville” was founded. But, as *Davisville '68*, the city’s centennial publication, says, “Challenges being faced by present-day residents of the Davis community are far different from those met by the earliest pioneer settlers. Bicycles by the thousands have replaced buckboards, and the character of this former railroad and agricultural center has been vastly changed by . . . an expanding university campus.”

The city of Davis is changing. It still retains many characteristics of the small college community the town once was, but the recent growth of the University has brought a corresponding development within the

town. From fewer than 20,000 people only a decade ago, the population of Davis stands today at 33,000.

The community is closely tied to the University (over half of the population 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 theatre, recreation and parks programs, and civic organizations have strong local support. The new 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, and the seven large and grassy city parks feature tennis courts, playgrounds, swimming pools, and playing fields.

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.

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. But the Davis campus is, above all, a residential campus. Most students (and faculty) live on or near the campus, and consequently the community life offers many opportunities for developing informal student-faculty relationships. If, however, you think of Davis as just a place to go to school, you’ll 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.

Because Davis was originally small and isolated, it naturally developed a tradition of close relationships between students and faculty members. Even though the campus has now grown to more than 17,000 students, its style remains friendly, informal, and personal. However, along with the casual and informal outlook of Davis students, there is an underlying seriousness of purpose and competitive pressure for academic excellence.

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 a 9-story concrete office tower and 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 many of the buildings are less than a decade old, the spirit of its past as the University Farm gives UCD a sense of tradition. There is little doubt that the vines growing on the new Chemistry building will one day cover all of its outside walls, and the trees around the Recreation Pool will be as cool and shady as the forty-year-old cork oaks on the Quad.

A University is never static. Its purposes and policies are always changing to meet new needs and new conditions. Looking back, we can see the development of a campus 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, whole, entire—reflects UCD's aim to bring together learning and life, scholarship and relevance, theory and practice, and general and professional education.



THE UNIVERSITY LIBRARY

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

The library on the Davis campus contains about 1,310,000 volumes and receives 39,000 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.

In addition to the main stack collection in the Peter J. Shields Library, there are 1,170,000 items on microcopy, 47,500 maps, more than 445,000 pamphlets, 16,500 rare books, 11,500 sound recordings, a number of which may be checked out, and a bibliographic center collection.

The Reference Department provides orientation and assistance in using the various library collections, which operate on an open-stack principle to permit direct access to the shelved volumes.

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 each quarter. A non-credit class entitled "Library Survival" is also offered.

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

The Reserve Book Service has several thousand volumes which are loaned out on a short-term basis. This material is heavily used because of assigned class readings.

Researchers, faculty members, and students have a valuable research tool at their fingertips with the Automated Information Retrieval Service (AIRS) located in the Reference Department of the Shields Library. Through computers located at two off-campus locations, bibliographies and references 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, nutrition, and psychology.

Unbound periodical titles—some 5,650—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, and the 310,000-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, and copying machines at various locations.

The Physical Sciences Library, a branch library located in a separate building on campus, has Energy Resources Development Agency reports and unpublished research reports from the National Aeronautics and Space Administration among its holdings. There are other branch libraries on campus for the health sciences and law, and numerous specialized departmental collections.



ORGANIZED RESEARCH UNITS

Agricultural History Center

The Center was founded in 1964 and assumed the responsibility of editing *Agricultural History*, the journal of the Agricultural History Society.

The director of the Center coordinates and administers the research, teaching, and service functions of the Center, with the assistance of an affiliated staff of faculty members and an advisory committee appointed by the Chancellor.

Art Conservation Laboratory

The Laboratory provides students with the opportunity and facilities to become familiar with scientific research in the fine arts, conservation of works of art, and museology. Courses, under the sponsorship of the Department of Art, are offered in museum methods and connoisseurship. The Laboratory provides conservation services to numerous museums and California historic sites.

Bodega Marine Laboratory

The Bodega Marine Laboratory is a Universitywide facility 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.

California Primate Research Center

The mission of the Center is to investigate selected human diseases and health problems which can best be studied with the nonhuman primate as the animal model. The broad areas of study include perinatal biology, respiratory diseases, infectious diseases and immunology, and behavioral biology. Additionally, there is a continuing program to investigate problems relating to husbandry, breeding, and disease-control of various species of nonhuman primates which are utilized in human health-related research programs, and to pursue systematic studies of their normal biological profiles.

The Center was established in 1962 and is supported chiefly by a grant from the National Institutes of Health.

There are currently 41 professional staff and 36 collaborating investigators with approximately 80 technical and supporting staff.

Carnegie Institution of Washington, Department of Embryology, Davis Division

Because of its schools of medicine and veterinary medicine and the location here of a national primate center, UCD was chosen for relocation of the world's most important embryological collection from the Carnegie Institution. Slides, specimens, case histories, photographs, and reconstructions gathered since 1887 comprise this world-renowned collection of human and other primate developmental material.

The resources of this department are available to qualified investigators studying various aspects of normal and abnormal primate development.

Center on Administration of Criminal Justice

The Center began operation in 1968 with a five-year grant from the Ford Foundation. The purpose of the Center's work is to bring about meaningful reform in the criminal justice system. The Center is a joint law and social science program operating under the sponsorship of the School of Law and the Institute of Governmental Affairs. Current projects include studies in the area of corrections, bail reform, and police practices.

Community Development Research Service

This service, in operation for only one year, offers assistance to social and behavioral scientists working with small communities throughout Northern California. CDRS stores information concerning California communities, coordinates research efforts, and acts as a channel of communication between state and local officials and researchers.

An index of related research activities, a bibliography of California community development, and a Northern and Central California data file containing detailed profiles of communities and urban neighborhoods, are being developed by CDRS in order to help identify research problems.

Computer Center

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. 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 in any manner.

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 249 of the Animal Science Building where the Center maintains 16 Tektronix Graphic Terminals for student use. The facility is open to students any time it is not scheduled for classroom instruction.

Crocker Nuclear Laboratory

This facility was established by the University in 1965 as an interdepartmental laboratory for the application of nuclear science to a variety of disciplines and houses a variable energy 76-inch cyclotron. The Laboratory has programs in nuclear physics and chemistry, air pollution analysis, neutron therapy, and neutron structural damage studies. Isotopes produced by the cyclotron are used in clinical and research applications. Teaching activities at the undergraduate, graduate, and postdoctoral levels in biology, medicine, radiochemistry, and physics utilize the facility.

Facility for Advanced Instrumentation

Organized in 1959 under a grant from the United States Public Health Service, 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, a fourier transform nuclear magnetic resonance spectrometer, amino acid analysers 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; they are also available as consultants and "trouble shooters" for research projects.

Food Protection and Toxicology Center

The Center is concerned with the development of tests to detect and measure small amounts of toxic materials in lower aquatic animals, the storage and elimination of toxic chemicals in mammals, and the rate of decomposition of pesticides by temperature, light, and air.

Studies serve 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.

Institute of Ecology

Established in 1966 as an organized research unit, the Institute fosters ecological and environmental research, stimulates and 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.

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

Through the grants it administers, the Institute provides financial assistance to undergraduate students through the Work-Study Program, and to graduate students by means of research and teaching assistantships.

Institute of Governmental Affairs

The Institute was begun 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 of state-wide government.

Institute activities include: an active publication program, including editorial services, manuscript processing, publication and distribution of research monographs; the preparation of grant proposals for extramural funding of social science research and the administration of awarded grants; a specialized library of published and fugitive materials which is open to faculty, students, and other users; computer and statistical consulting, maintenance of the Statistical Package for the Social Sciences for the Burroughs B6700 computer, and operation of a data library by the Social Science Data Service, a unit of IGA; the training of graduate and undergraduate students in research methods through participation in faculty-led projects; and organization and conduct of policy workshops and conferences.

Institute of Marine Resources

This statewide Institute was organized in 1955 with headquarters at La Jolla. That part of its activities dealing with the use of the ocean as a source of food was located at Berkeley in the Department of Nutritional Sciences until July, 1970, when it was transferred to Davis and became part of the Department of Food Science and Technology. The staff is concerned with factors affecting the chemical, biochemical, and nutritional properties of fish and other seafoods, aquaculture, and with improving the utilization of California's marine resources.

Radiobiology Laboratory

The Laboratory is now entering the third phase of its 25-year existence. Previous activities under U.S. Atomic Energy Commission support included studies on effects of X-irradiation and effects of internally deposited radionuclides. Currently, under U.S. Energy Research and Development support, the radiation studies are being supplemented by an expanded research effort into non-nuclear, health, and energy-related bioenvironmental studies. The Laboratory staff includes about 100 professional, technical, and support personnel.

University Arboretum

The Arboretum occupies an area of about 70 acres, providing materials for teaching and research in the plant sciences departments. Most of the plants are attractive but drought-tolerant trees and shrubs. The acreage also includes paths and picnic tables for student 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.

Water Resources Center

The Water Resources Center is a Systemwide organized research unit charged with coordinating

water resources research on the several 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 resources systems engineering, economic evaluation of water development and conservation, political strategy in water resources 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.



Additional Academic Programs

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 its five units: Program for Part-Time Degree Students, University Extension, Summer Sessions, Arts and Lectures, and Conferences and Campus Services.

Program for Part-Time Degree Students

Information:
376 Mrak Hall
752-2820

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 part-time. Part-time students may change status between full-time and part-time as their circumstances change. An undergraduate student may take from 3 to 9 units per quarter. Minimum progress is waived for graduate and undergraduate part-time students.

Off-Campus Classes

Part-time students can attend regular classes on campus or at Learning Centers and TV Sites off campus. Off-campus students will find it necessary to attend classes on campus in order to fulfill their degree requirements.

Learning Centers are located at San Joaquin Delta College in Stockton, Diablo Valley College in Pleasant Hill, Yuba College near Marysville, and Solano College near Fairfield.

TV Sites are located at the Centers as well as at Cal Trans, Water Resources Agency, and Aerojet in Sacramento, Lawrence and Sandia Labs in Livermore, Dow Chemical and Los Medanos College in Pittsburg, and Beale Air Force Base near Marysville. Master's and Certificate Programs in Civil, Electrical, Mechanical, and Chemical Engineering as well as in Applied

and Computing Science are available via Microwave TV at off-campus sites.

Fees for Part-Time Students

- Undergraduate quarterly fees are \$162.50.
- Graduate fees are \$223.50.
- Nonresidents must pay \$53 per unit in addition to this fee.

Part- and full-time students have use of the same facilities and are eligible for the same services, including the Student Health Service. Part-time undergraduate students are also members of the Associated Students, UC Davis.

Reduced Study List

A \$50 reduction of the Educational Fee can be authorized for regular undergraduate students who enroll for less than 9 units of course work and who do not qualify for part-time status. This reduction is for one quarter and the student is expected to maintain minimum progress. Petitions for Reduced Study List are filed through the Program for Part-Time Degree Students.

University Employees

Full-time University employees who are qualified for admission can work toward bachelor's and master's degrees through the Program for Part-Time Degree Students. Employee-students enrolling each quarter in courses totaling no more than 6 units or only one course, regardless of the number of units, pay an undergraduate fee of \$69.50 and a graduate fee of \$76.50. Undergraduate employee-students who enroll for a maximum of 9 units pay \$162.50 and graduate employee-students who enroll in more than 6 units pay \$223.50.

Academic Reentry Office

An Academic Reentry Office functions in conjunction with the Program for Part-Time Degree Students and offers:

- Preadmission counseling, reentry advising and continuing assistance
- Orientation to the campus and workshops on academic skills sponsored quarterly
- Monthly newsletter
- Weekly noon groups for reentry students (EN-CORE)

Application Deadlines

Applicants for admission to the University as part-time students must meet the following quarterly application deadlines:

- Fall Quarter — June 1
- Winter Quarter — October 1
- Spring Quarter — January 1

Students who wish to change status between full-time and part-time should file a petition with the Program for Part-Time Degree Students before the end of the second week of class of the quarter. (See page 8.)

University Extension

Information and catalogs:
4445 Chemistry Addition
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, and 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, criminal justice, labor relations, women's studies, 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 the ranks of 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 you to accelerate your 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.

In 1977 there will be two six-week Summer Sessions at UC Davis: June 20 through July 29, and August 1 through September 9. All other University campuses, except San Francisco, will also hold Summer Sessions.

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.

Committee for Arts and Lectures (CAL)

Information:
150 Memorial Union
752-2523

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

In 1976-77 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:
Conference and Campus Services Office
4475 Chemistry Addition
752-2813

Non-student campus and off-campus groups desiring to use campus facilities to sponsor meetings, workshops, conferences, or similar activities should contact Conferences and Campus Services. A one-stop reservation service, this office provides a single location for assistance with arranging all the various components of meetings and conferences.



"I like mingling with my professors outside the classroom situation. In Davis you see your instructors in restaurants, theatres, even supermarket checkout lines, and you realize they're people like everyone else."

EDUCATION ABROAD

Information:
Education Abroad 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, Hong Kong, Ireland, Egypt, France, Germany, Italy, Israel, Spain, Kenya, Ghana, and the U.S.S.R.

An around-the-world itinerary for madcap travelers? No. These are the countries and cities where you can study as an undergraduate participating in the University's Education Abroad Program (EAP).

Most EAP experiences are for the academic year. Exceptions are the two-year Hong Kong program, which will accommodate seniors or first-year graduate students interested in Asian or Chinese Studies, the summer program in Tübingen (Germany) for MAT candidates, and the one-semester program in Leningrad (U.S.S.R.).

Graduate students who have completed at least one year of graduate work at the University and have the support of the Graduate Division and their department 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 unit credit is given for courses satisfactorily completed.

Eligibility requirements include:

- At least 84 quarter units by the time of participation
- At least a 3.0 GPA for coursework completed in the University of California
- 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 pro-

fessors 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 \$3,500 to \$5,600.

Application deadlines vary depending on which country you study in. Generally, applications should be submitted during the Fall Quarter for the following academic year. If you intend to study abroad during your senior year, careful advance planning is necessary to make sure that all degree requirements will be met. Consult with your major adviser, the Dean's Office of your College, and the Campus EAP Coordinator. See page 179 for information on EAP centers and study programs.

You can obtain informational brochures on other opportunities for study, travel, and employment abroad from the Services for International Students and Scholars Office, 323 South Hall, 752-0864.

WORK-LEARN

Information:
Work-Learn 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 educational goals. Or expand your awareness of the "real world." Or find out if you are really interested in a career in sales or research or teaching.

One way to help yourself make these and other important decisions is to participate in a Work-Learn experience. Closely tied to academic programs, advising, and career guidance, Work-Learn expands your learning beyond the campus and enables you to explore potential professional and career opportunities.

Often the biggest obstacle to finding a job in any field is lack of on-the-job experience. It's very difficult to get that first break. The Work-Learn internship can provide a foothold in a job that may become permanent after graduation. And, even if it doesn't produce a future job there, the internship can give you the experience you need to qualify for another job in that field.

Here is how it works: Participation may be full-time or part-time, credit or non-credit, voluntary or with

monetary compensation—depending on your needs and interests and the availability of opportunities. The Work-Learn experiences must emphasize learning rather than routine activities, and include field supervision by a qualified non-faculty person (where appropriate) and/or 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. These include:

- *Bixby Work-Learn* for internships in agricultural, biological, and environmental sciences
- *Cooperative Education* for internships in engineering and the physical sciences
- *PROBE* (Professional and Occupational Broadening Experiences) for internships in humanities, social and behavioral sciences
- *Law*
- *Health Sciences*

Additional Work-Learn opportunities and courses are available through the Departments of Applied Behavioral Sciences, Economics, English, Environmental Horticulture, Family Practice, Geography, History, Political Science, Psychology, Rhetoric, and the American Studies Program. The Colleges of Agricultural and Environmental Sciences and Engineering have College-wide courses that provide academic credit.

UNIVERSITY PROFESSORS

One of the University's valuable and unique resources is its small roster of University Professors, presently numbering ten, 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 chair-

persons 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 Melvin Calvin, Director
Laboratory of Chemical Biodynamics
Lawrence Berkeley Laboratory
UC Berkeley

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

University Professor Josephine Miles
Department of English
UC Berkeley

University Professor Glenn Seaborg
Department of Chemistry
UC Berkeley

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 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:
Housing Office
111 South Hall
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 room-and-board rate for 1976-77 is \$1,500 for a double-occupancy room. This includes local telephone service. Rooms come complete with furniture, study lamps, private telephone, bedding, and linens.

The Housing Office automatically receives your name and address if you check "University Operated Housing" when filling out the University Admissions Application. All necessary information and applications are then mailed to you.

Married Student Housing

Information:
Married Student Housing Office
Orchard Park
752-4000

There are 476 apartments on campus for married students and single parents. Both furnished and unfurnished apartments are available. Sorry, but pets are limited to only fish, canaries, and parakeets.

Considering that off-campus apartments generally cost \$50 to \$75 more per month than on-campus apartments, you can see why on-campus apartments

are assigned only from a waiting list. Since a wait of 6-8 months is common, please submit your application as early as possible.

Rents for 1976-77 (including all utilities and trash collection) are:

- 1-bedroom unfurnished, \$114/month
- 2-bedroom unfurnished, \$130/month
- 2-bedroom furnished, \$146/month

Off-Campus Housing

Information:
Off-Campus Housing Office
114 South Hall
752-2483

If you choose to live off campus—about 75 percent of UC Davis students do—the Off-Campus Housing Office will probably turn out to be a very valuable resource. The Office provides many special programs, including grievance counseling and roommate selection services. Useful publications, such as the *Housing Viewpoint* and *On Living in the Community*, leasing information, and the ASUCD Model Lease, are also available there.

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

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

RECREATIONAL FACILITIES AND PROGRAMS

No matter what your recreational bent—horseback riding, dancing, music listening, chess, pottery, 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—and 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 happening year-round. Whether the action takes place in one of several gymnasiums, the track at Toomey field, the Memorial Union Games Area, the tennis courts, or the swimming pool, participation is always spirited and lively.

Theatre-goers, too, will find a rich and lively fare at Davis. A variety of productions and concerts are presented in the Dramatic Art Building's Main Theatre, a 500-seat proscenium stage facility. The Wyatt Pavilion Theatre (a former livestock-judging pavilion converted into an octagon-shaped Elizabethan theatre with thrust stage), the Graffiti Theatre in Segundo Hall, and a number of other on-campus theatres, are well-suited for the many dramatic readings and productions that are presented each year. Most off-campus groups perform in the 1,800-seat Freeborn Hall.

Memorial Union

Information:
Director of Union and Recreational Services
460 Memorial Union
752-2525

The **Memorial Union** (MU), at the north end of the Quad, is the hub of campus activities. Bring yourself up to date on what's going on by stopping by the Information Desk in the main lounge, or by calling 752-2222. In the MU you'll find the UCD Bookstore, KDVS radio, the *California Aggie* newspaper, the Campbell Recreational Reading Library and Cameron Music Listening Room, Memorial Union Art Gallery, ASUCD Coffee House, MU Dining Commons, Associated Students offices, Campus Box Office, lounges, outdoor plazas, the Games Area with a 16-lane bowling alley and 2 billiards rooms, and Switchboard, a student-staffed information center that claims it can answer any question.

The **Putah Creek Recreation Area** and the **Arboretum** feature picnic areas, bicycle and walking

paths, bridle paths, and a small lake with boating facilities. 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 was planted with trees and shrubs from California and many other parts of the world for teaching, research, and general enjoyment.

The **Silo Barn Student Center**, once billed "The World's Most Modern Dairy Barn," was built in 1908 and renovated in 1970. It now features a snack bar, game facilities, a large multi-purpose room, offices for Student Special Services, and the Health Sciences branch bookstore. A new addition, the **Silo Craft Center**, is an ideal place to channel your creative energy. Workshops and classes are offered each quarter in such varied crafts as woodworking, weaving, spinning, jewelry making, batik, ceramics, photography, silkscreening, lapidary, leatherworking, upholstery, and many, many more.





Recreation Hall

Scheduled for completion in the fall of 1977, Recreation Hall is a multi-purpose facility which will be used and enjoyed by virtually everyone on the campus. Top priority will be given to housing the enormously popular intramural sports programs. Additionally, the facility will be used for intercollegiate athletics.

Rec Hall will increase the seating capacity for major events from the current 1,500 in the gymnasium, or 1,800 in Freeborn Hall, to approximately 10,000 members of the campus community in one location.

ASSOCIATED STUDENTS (ASUCD)

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

At Davis, one set of initials you will hear frequently is "ASUCD." That's short for the Associated Students of the University of California, Davis. How do you join it? If you have registered as an undergraduate, you are a member already. Out of the \$212.50 you pay each quarter, \$9 goes to ASUCD. (Graduate students may become members by paying the \$9 fee.) The money is spent on activities and services that will make your life as a student a little easier, less expensive, or just more worthwhile.

The student government, which controls how and where this money goes, is made up of three branches. The president and vice president, who comprise the executive branch of ASUCD, keep the student body in contact with other universities, the University administration, The Regents, and the Davis city government.

The Student Senate is the legislative branch of the government. The 24 members of the Senate are elected from four commissions:

Public and External Affairs deals with general politics affecting students mainly from groups outside the University (e.g., the City of Davis, Regents, State Legislature).

Student Life is concerned with implementing and evaluating student services.

Internal Affairs acts as a liaison with the campus administration. A specific responsibility of the commission is nominating students to the Chancellor's Administrative Advisory Committees.

The **Recreational Swimming Pool Complex** includes a very large free-form swimming 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 **Equestrian Center**, southwest of the Veterinary Medical Teaching Hospital, is popular all year round. Trail rides and instruction in both English and Western riding are available for beginners through advanced riders.

The **Outdoor Adventures** program is headquartered in Temporary Building 24, just east of Silo Barn. Outdoor Adventures operates a rental outlet, 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.

Freeborn Hall, on the west side of the MU, is a 1,800-seat assembly hall used for dances, banquets, dramatic and musical events, lectures, and conferences.

Academic Affairs concerns matters that directly relate to students' academic careers (e.g., grading policies, teacher evaluation, graduation requirements).

The judicial branch consists of the Student Relations Council whose members are appointed by the President of ASUCD.

ASUCD operates over fifty activities and services for UCD students. Information about these services can be found in the *ASUCD Student Catalog and Telephone 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, and the Coffee House in the Memorial Union. The ASUCD-sponsored Experimental College offers a variety of non-traditional classes each quarter for students interested in diversifying their educational experience. Other ASUCD activities include Radio KDVS stereo FM and AM, the Cal Aggie Marching Band, Student Forums, Entertainment Board, the Bike Barn, Zapple Records, Picnic Day, and free legal services. ASUCD also cooperates with other University of California campuses to operate a full-time Student Lobby in Sacramento to represent student interests to State government.



"You're probably not going to see so many students participating in intramural sports anywhere else."

—Physical Education Instructor

STUDENT ORGANIZATIONS AND ACTIVITIES

Information:
Student Organizations and Activities Center
Room 10, Lower Freeborn
752-2027

More than 200 student groups are served by the Student Organizations and Activities Center. Political, religious, social, cultural, departmental, international—every type of student group on campus has access to the Center, where organizational workshops, support services, and advising programs help sharpen group effectiveness. The results? Action-oriented student organizations that sponsor a significant number of activities at UC Davis year after year.

For information about reserving campus facilities (including the Putah Creek Lodge, the Recreation Pool and Lodge, and meeting rooms) for student groups, call the reservations coordinator, 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 think you'll never need some of these services, but you may be missing out on something important if you don't give them a try.

Advising Services

Information:
Advising Services
2nd floor, South Hall
752-3000

Advising Services coordinates five student service units: Academic Advising Intern Program, The First Resort, Health Sciences Advising, Pre-Law Advising, and Orientation and Summer Advising. 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 Advising Intern Program (AAIP) places peer advisers in more than twenty departments to help students find the answers to their questions about major requirements and University policies and procedures. The AAIP adviser complements faculty advising by providing a student perspective on the department. AAIP staff are trained to provide information and assistance about graduate schools, job opportunities, and college requirements. For more information contact the AAIP office in South Hall, 752-3000.

The First Resort is a place to go if you are feeling bogged down with University red-tape, registration procedures, or academic problems. 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 **Health Sciences Advising Office** (103 South Hall, 752-2672) will be an important place for you if you are exploring or considering a career in a health science area. The professional and student advisers have knowledge about a variety of health careers and

can provide information and advice about professional prerequisites, application procedures, curricula, and career options. The office includes an extensive library of school catalogs, statistics, and information concerning health care and careers. If you need information or wish assistance with applications, the staff of the Health Sciences Advising Office is ready to listen and to help.

The **Pre-Law Advising Office** is where students interested in legal careers can find information, advising, and help with planning and procedures. The staff can advise you about admission requirements and about trends and alternatives in the field of law. The office maintains a reference library of law school bulletins, legal assistant information, admission test materials, career information, and the *Pre-Law Handbook*. The Coordinator and law student intern can be contacted in South Hall, 752-3009.

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 input to orientation programs, through ideas and assistance, is always welcome. The Coordinator's office is located in South Hall, 752-2022.

Counseling Center

Information:
219 North Hall
752-0871

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

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

The Counseling Center is staffed with psychologists and counselors who, in addition to providing services to students directly, also work as consultants, teachers, 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

Information:
TB 16
752-2790

The primary factor behind the effectiveness of The House is *people*. This drop-in center is staffed by trained volunteers—fellow and former students—who are there to listen, to talk, and to help you find solutions to your problems. Classes and workshops designed to help you explore your interests and talents are also part of their program.

The House is open 24 hours a day for emergencies, and 10 a.m. to midnight otherwise. During finals week, The House is open day and night, so drop in for a study break.

Intercultural Center/Peer Advising and Counseling Program

Information:
Intercultural Center
3rd Floor North Hall
752-3492
PAC Program
3rd Floor North Hall
752-3472

The purpose of the Intercultural Center is to promote understanding, communication, and knowledge of the various needs, concerns, and problems that minority and low-income students face daily. The Center's function is to provide information and assistance for preserving, transmitting, and enriching the important elements of our cultures, including the products of scholarship, research, creative imagination, and human experience. These are dealt with specifically through the following programs: peer advising and counseling program, intercultural programs, outreach programs, graduate and professional opportunity programs, and community relations programs.

The Peer Advising and Counseling Program, which is one facet of the Intercultural Center, is a program designed to assist minority and low-income students



"The personal atmosphere at Davis is what first attracted me."

—Freshman,
Undeclared

with their academic, social, and personal adjustments while attending the University. Peer Advisers and Counselors (PAC's) work through the Intercultural Center, and in "outreach" programs in the Counseling Center, Financial Aid Office, Services for International Students and Scholars Office, Learning Assistance Center, and the ethnic centers (Asian American Studies, Black Studies, Chicano Studies, Native American Studies).

Educational Opportunity Program (EOP) Counseling

Information:
Counseling Center
219 North Hall
752-0871

The Educational Opportunity Program's counseling services are furnished to minority and/or low-income students admitted through EOP (see page 45).

As an EOP student, you will be assigned a counselor with whom you can maintain contact throughout your University career. The EOP counselor will become concerned and involved with your academic, financial, personal, social, and overall adjustment to the campus.

Through individual interviews and group discussions, your counselor can help you choose an academic major, schedule courses, and pinpoint occupational goals.

Counselors also provide referrals for a wide range of advisory services, and furnish information about various professional opportunities you may want to investigate.

Learning Assistance Center (LAC)

Information:
Learning Assistance Center
Temporary Building 10
752-2013

At the Learning Assistance Center you can receive assistance in overcoming a wide spectrum of learning difficulties, including:

- Composing papers
- Writing improvement
- General and specific (subject) study skills
- GRE and LSAT exams
- Memory improvement
- Spelling improvement
- Vocabulary building

- Note taking
- Organizational skills
- Test-anxiety reduction
- Test taking
- Reading efficiency
- Time budgeting
- Relaxation-concentration

Learning Specialists can assist you individually, or you may participate in a variety of workshops designed to aid specific areas of study. The Learning Laboratory has self-help tapes and films which enable you to work at your own pace. The LAC Library contains a wide spectrum of programmed instruction materials, reference books, and preparation materials for the GRE and LSAT exams. Many of these may be checked out.

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

STUDENT SERVICES

Student Health

Information:
Cowell Hospital and Student Health Center
752-2300

Your health. It 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 (or summer session) through the last day of the quarter (or summer session) or to the date of official withdrawal.

Some of the Health Center services 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/or children can be purchased at the beginning of each quarter in the Health Center.

International Student Services

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

During the past three decades UC Davis has played a leading role in the education of students from many different countries. If you are an international student, researcher, or scholar, the staff of Services for International Students and Scholars can provide assistance on all matters pertaining to your education or residency in the United States.

The week prior to Fall Quarter registration, Services for International Students and Scholars holds a special Orientation for new international students. All new and transfer students are urged to attend this annual pro-

gram, which assists in actual registration and class enrollment, procedures which can be confusing to *any* new student. It also provides help, advice, and information on housing, banking, academic regulations, cultural differences, legal and visa expectations, campus and community tours, and introductions to different campus services.

You are advised to go over your budget carefully when drawing up plans to attend the University, since living costs for international students are generally higher than for U.S. citizens. SISS recommends that you budget a *minimum* of \$360 per month for 12 months for living expenses, books, supplies, and incidental expenses—*plus* all quarterly fees listed on page 35. Even this sum may not be enough for dental care, unusually expensive books, laboratory equipment, and surgical instruments. Also, remember that extra expenses are necessary during the first few months of apartment living because of deposits or cleaning fees, telephone installation costs, towels, bedding, and cooking utensils.

Many international students enroll in at least one of the two Summer Sessions. Be sure to add the Summer Session fee (approximately \$175 per session) to your possible expenses.

There are no grants or loans awarded by the University to international students during their first year of study, and *no aid can be guaranteed* in following 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.

See pages 46 and 104 for admission details and procedures.

Services to Handicapped Students

Information:
101 Silo
752-3184

If you are physically disabled or blind, you can draw upon the advice, assistance, and resources available through Services to Handicapped Students (SHS).

Recognizing that individual circumstances call for individual responses, SHS helps you find the resources you need to gain equality of opportunity in your University experience. As advocates for disabled students at Davis, SHS has pressed for removal of architectural barriers, conducts programs to sensitize the community to the problems of the disabled, and provides information on sources of financial assis-



"Be prepared to spend a lot of time studying; however, be prepared also to take time off to have fun. Your experience here at UCD should make you a well-rounded individual."

*—Sophomore,
Engineering*

Student Life

tance. Their newsletter, OMPOINT (Organizing to Maximize Physical Opportunity, Independence, and Normal Transactions), is published quarterly.

Other assistance includes:

- Specialized learning and taping equipment
- Reader and attendant recruitment
- Priority for class enrollment
- Campus and community mobility orientation
- Advice on aids and vehicles
- Housing information and residential aids
- Equipment repair

On the personal level, SHS can help you manage social situations, establish independent living, define career goals, and make the transition from UCD to a job or graduate school.

Finally, SHS can help you contact State or Federal agencies for financial aid, counseling, training, and job placement.

Veterans Affairs

Information:
Veterans Affairs Office
200 Silo
752-2020

You may be entitled to various veteran's benefits under State and Federal laws. If so, the Veterans Affairs Office can assist you.

To initiate a claim, write the Veterans Affairs Office or drop by 200 Silo, preferably before registration. They can give you forms, information, and advice, and will also certify your attendance to the Veterans Administration. Remember to go by the Office each quarter (bring your current registration card for recertification) in order to avoid any delay in benefits. And in case a delay does occur, the Office will help resolve the problem.

Other special services to veterans and their dependents are coordinated by the Office. These services include employment, financial aid, V.A. work-study, and tutorial assistance.

Although the draft has lapsed for those not in the medical profession, the rest of the Military Service Act has no expiration date and continues on a "standby" basis.

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
- Rape crisis counseling and women's self-defense programs
- Individual peer counseling
- Resource files and referrals for birth control, marital problems, legal rights, legislation, child care, and sexuality
- 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 part of their services.

The Center is staffed by professionals, student interns, peer counselors, and community 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, Project Outreach, counseling, legislative research, publicity, and on the newsletter.

Student Employment

Information:
Student Employment Center
University House Annex
752-0520

The Student Employment Center assists regularly enrolled students, students on Planned Educational Leave, and student spouses in finding part-time and



full-time, temporary positions, both on and off campus. Students who have received a letter of acceptance but have not yet registered may also use this service during the quarter (or summer) prior to enrollment. The Center is open from 8 a.m. to 12 noon and 1-4 p.m.; listings are posted twice daily.

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

Career Planning and Placement

Information:
Career Planning and Placement Center
2nd floor, South Hall
752-0522

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 Career Planning and Placement Center may be able to help you.

The Career Planning and Placement Center assists undergraduates, graduates, and alumni in career exploration, development of career or employment goals, and placement into full-time employment. If you are considering dropping out of the University for a term or longer, a placement adviser can also give you information about employment opportunities.

Some of the things you can find at the Center include individual career advising and group seminars, workshops on communication, interviewing and job-seeking skills, and seminars to explore career fields and employment trends. The Career Resources Library has material that can help you learn how your major field of study can be translated into job opportunities. The Center also has information on which majors various companies are currently seeking, as well as descriptions for a variety of positions. A useful manual for job-seekers, prepared by the Center, provides guidelines for preparing a resumé, tips on interviewing, and information on employment in government, business, and education.

To assist students in finding jobs after graduation, the Career Planning and Placement Center solicits and maintains files of vacancy listings, arranges employment interviews, and schedules on-campus recruiting by employers.

So don't wait until you are a senior—about to be thrust into the job market—before thinking about your career

interests. Visit the 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 planning a career in teaching should register with the Educational Placement Office. By using the information you provide about your background, training, and professional experience, this office can match your qualifications with available positions—although the University reserves the right to refer only those persons who are considered to be fully qualified. Placement advisers counsel candidates, communicate with employers, receive job listings, and arrange interviews. This service is an important one for prospective teachers, and students and alumni are encouraged to use it.

Cal Aggie Alumni Association

Information:
The Alumni Center
Academic Office Building IV
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. Many people before you have made this decision, and continue to support Davis through the Cal Aggie Alumni Association. The progress of Davis as a major University has been aided by the participation of alumni, through the Association, in providing support and sponsorship for many activities and programs. Cal Aggie Camp, *UCD Spectator*, Picnic Day, UC Student Lobby. The Ambassador Program, Recreation Hall Campaign, legislative relations, and student loans and scholarship programs all receive Alumni Association support.

All graduates of UC Davis are members of the Association. However, effective organization and performance of our programs and activities require certain levels of support, both personal and financial. Those members contributing to the Association through dues are given the status of Sustaining Membership, and are granted, in return, special opportunities and benefits.



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 financial assistance beyond those funds 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 a tuition of \$635.00 per quarter. (See page 311 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 ..	\$100.00	\$100.00
Memorial Union Fee	3.50	3.50
Student body membership fee	9.00	
Educational fee	100.00	120.00
Total for California residents	\$212.50	\$223.50
Tuition for nonresidents	635.00	635.00
Total for nonresidents	\$847.50	\$858.50

Additional Fees and Expenses

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

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

Late registration (\$10)

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

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

Applications for readmission, Planned Educational Leave, or intercampus transfer (\$20)

For details concerning fees and deposits, consult the publication *Student Fees and Deposits 1976-77*, obtainable from the Registrar's Office. Current fees are also published in the *Class Schedule*.

These fees are for the 1976-77 academic year and are subject to change without notice.

Explanation of Fees and Expenses

University Registration Fee: \$100 per quarter (\$150 per semester for students in the School of Law). Covers normal expected usage of such facilities as laboratories, gymnasium, counseling and placement services, health services, etc.

Educational Fee: Paid by all undergraduates at \$100 per quarter; students in the School of Law at \$180 per semester; and all other graduate students at \$120 per quarter. Used to support a portion of the cost for the educational program. Undergraduate students enrolling for less than 9 units in any quarter may petition the dean of their college or school to pay the reduced Educational Fee of \$50.

*Students in the School of Law see the School announcement and under explanation of fees.

Fees, Expenses and Financial Aid

Nonresident Tuition: \$635 per quarter; \$952 per semester for students in the School of Law (see the nonresident tuition fee statement on page 311).

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

Student body membership fee: \$9.00 per quarter. All full-time undergraduate students are members of the Associated Students, University of California, Davis (ASUCD). Graduate students may become members by paying the fee.

Living Expenses

The Financial Aid Office estimates the average 1976-77 expenses of a UCD undergraduate who is single will total \$3900 including \$638 for fees, \$265 for books and supplies, \$900 for housing (see page 25), \$1220 for food, \$490 for personal expenses, \$230 for transportation, and \$157 for medical expenses. Estimated expenses for other single students are: graduate students, \$4300; law, \$4425; veterinary medicine, \$4875; first-year medicine, \$4650; second through fourth year medicine, \$5400. For married students these categories range from an undergraduate low of \$6500 to a high of \$8575 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 chapter on housing and in the *Financial Aid Handbook*, available from the Financial Aid Office.

FINANCIAL AID

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

The Financial Aid Office provides financial assistance to qualified students who cannot pursue their education at the University without such help. Budgetary counseling is also available.

Financial need is a major criterion for most loans and grants. Your need is established by a review of your Financial Aid Application, Financial Aid Form, and Income Tax forms.

Applications are available about November 1 for the following academic year. Filing deadlines for the following year are usually in December, except for Short-Term and Emergency Loans, Guaranteed Student Loans, Basic Educational Opportunity Grants, and a few other programs. Deadlines and application procedures are detailed in the *Financial Aid Handbook*, available from the Financial Aid Office.

Although funds vary from time to time, a combination of loans and work-study funds tailored to your individual circumstances is usually available. Whenever awarding guidelines and funding levels permit, your financial aid award is partially made up of grants (outright gifts that do not have to be repaid). Undergraduates with outstanding academic records may apply for various scholarships by submitting separate applications. (See the Scholarship section beginning on page 38.)

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 106 for more information.)

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 is partially made up of grants.

Loans: A financial aid award almost always includes a long-term loan. These loans usually have an annual interest rate of 3 percent. Repayment begins after you graduate or withdraw from school.

Work-Study: The work-study program was designed to expand employment opportunities for college students. If you are awarded work-study, you will be given referrals to part-time work-study jobs on campus or with off-campus nonprofit organizations. You may be able to work full time during school vacation periods. Job opportunities range from clerical and janitorial work to highly technical jobs in your own field.

Scholarships: Scholarships are awarded on the basis of academic excellence and scholastic achievement. For some scholarships, financial need is a consideration. (See page 38.)



"Keep things in perspective. Set up goals for yourself and decide what you want from this institution—socially, emotionally, as well as intellectually . . . but be prepared to work for it."

—Senior, Textiles

Financial Aid Awards

Basic Educational Opportunity Grant (BEOG) applications are required from all undergraduate financial aid applicants. Applications are available in February for the following year at the Financial Aid Office, U.S. Post Offices, and high schools.

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

California State Scholarship applications are required from all eligible undergraduate financial aid applicants. Applications, usually due in late November for the following academic year, are available from California high schools, colleges, and the California Student Aid Commission, 1410 Fifth Street, Sacramento 95814.

- \$300 to \$600 per year
- California residents only
- Renewable up to 4 years

Supplementary 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.

- \$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

Educational Fee Grants provide qualified California residents with a grant to pay their Educational Fee for the first three quarters.

- \$300 maximum
- New undergraduate enrollees only

Educational Opportunity Program (EOP) Grants assist eligible students who have been admitted to the University under the EOP program.

- \$5,000 maximum per year
- Amount depends on financial need
- Renewable each year

Improved Access Grants are usually awarded to students who have completed 56 or more semester units (84 quarter units) of transferable work in a community college with a grade-point average of 2.0 or better.

- Amount depends on financial need
- Upper-division community college transfer students only

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

Regents' Loans of up to \$6,000 per student are available. If graduate studies are undertaken, payment may be deferred until completion or termination of studies.

- \$1,500 maximum per year
- 3 percent interest
- Repayment begins after graduation or withdrawal

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 made as an undergraduate
- 3 percent interest

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 Financial Aid Office any time during the academic year.

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

Cal Aggie Alumni Association Emergency Student Loans are made on a no-questions-asked basis with a valid Registration Card and one other piece of identification, preferably a driver's license. Apply at the Alumni Center.

- \$25 maximum
- 45-day repayment period

Guaranteed Student Loans are available through banks and other lending institutions. 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
- 7 percent interest
- Repayment begins 9 months after graduation or withdrawal

Law Enforcement Education Program grants are available to students who are full-time employees of publicly funded law enforcement and criminal justice agencies. Loans are available to qualified students enrolled in studies directly related to law enforcement and criminal justice. Applications and information can be obtained through University Extension.

- \$250 maximum grant per quarter
- \$2,200 maximum loan per year

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

College Opportunity Grants are based on financial need and are renewable annually. Applications may be obtained from high school counselors or from the California Student Aid Commission, 1410 Fifth Street, Sacramento 95814.

- \$1,537 maximum per academic year
- Undergraduate California residents only
- Applicants must be entering their freshman year at the time of first application

State Graduate Fellowships are given to students of outstanding ability and achievement. In addition, consideration is given to students from disadvantaged backgrounds who show substantial potential for success in graduate school. Applications are available at graduate and professional school offices, and from the California Student Aid Commission, 1410 Fifth Street, Sacramento 95814.

- \$874 maximum per year
- California residents only

The **Work-Study Program** refers eligible financial aid recipients to part-time jobs on and off campus. Opportunities range from clerical and janitorial work to jobs requiring a high degree of technical skill. (For other student employment opportunities, see page 32.)

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

Social Security Benefits are available to students whose parents receive Social Security retirement or disability benefits, or whose parents were eligible for these benefits but are deceased.

- Monthly educational benefits
- Apply at Social Security Offices

SCHOLARSHIPS AND AWARDS

Information:
Scholarship Office
12 Mrak Hall
752-2393

At UC Davis, a special effort is made to recognize exceptional students. Approximately 100 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.

Applications for scholarships are available at the start of each Fall Quarter for the following academic year. Deadline for submission of application materials is *December 4*. 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 106.)

Types of Scholarships

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 35). The Regents' Scholarship Advisory Committee conducts personal interviews during the final selection process. These scholarships are renewable as long as you maintain a 3.0 grade-point average.

- \$'s vary—up to full financial need
- 2-year and 4-year renewable scholarships

President's Scholarships are limited in number, and are restricted to freshmen or juniors enrolling in the Fall Quarter. These awards are based on academic excellence, promise, and financial need.

- \$500 maximum
- 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

Army Scholarships are awarded in limited numbers to outstanding high school seniors planning to enroll in the Reserve Officers' Training Corps (ROTC) at UC Davis. Applications are available in November from the Department of Military Science, 125 Hickey Gymnasium, 752-0541.

- \$100 per month
- All educational costs paid
- Full 4-year scholarships

Other Scholarships are made possible by individual donors, private corporations, and various agencies. Some scholarships are limited to students in particular majors or colleges, residents of certain geographic areas, or students fulfilling other special requirements.

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:
Office of Admissions
175 Mrak Hall
(916) 752-2971

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 Undergraduate Studies entry below.) The second step is to determine the type of application you are submitting. (Admission categories are defined below.) 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. In addition, you must arrange to have all supporting documents (test scores and transcripts) forwarded to the Admissions Office immediately after filing your application.

Application and admission procedures are outlined beginning on page 47. A summary of the steps in the application procedure appears on page 49. Use this checklist to follow your application through the admissions process.

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 Admissions Office. In order to tour the campus, contact the Visitors Services and Ceremonies

Office (129 Mrak Hall, 752-0539) for scheduled or individual tours. If you would like to visit classes, you can also arrange that through the Visitors Services and Ceremonies Office.

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 42) is a student who has graduated from high school or who has earned a "Certificate of Proficiency," but has not enrolled since high 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** applicant (page 44) is a high school graduate who has been registered in a regular or extension session of a college or university other than the University of California.

An **intercampus transfer** applicant (page 46) 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 45) 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 (page 52) is a student who was formerly registered on the Davis campus, and who has interrupted the completion of consecutive quarters of enrollment and who is not currently participating in the Planned Educational Leave Program.

A **limited status** applicant (page 46) is a college 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 46) 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 45) is a college graduate who seeks an additional bachelor's degree in a new field *unrelated* to the original field in which the first degree was awarded.

An **international** applicant (page 46) is a student who is not a U.S. citizen or immigrant.

A **concurrent enrollment** applicant (page 47) is a community member who wishes to fulfill academic interest and/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.

A **part-time degree** applicant is a person who wishes to complete the bachelor's degree at UC Davis on a part-time enrollment basis. This program is offered through the Program for Part-Time Degree Students in the Division of Extended Learning. See page 20 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 101 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 (Law, Medicine, Veterinary Medicine). Please see the appropriate sections in this catalog for more information.

UNDERGRADUATE STUDIES

Undergraduate studies at the University of California, Davis, are divided into three colleges, the College of Letters and Science, the College of Agricultural and Environmental Sciences, and the College of Engineering. Within each college a variety of majors (fields of concentration) are offered which reflect the educational goals of the college.

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 page 66). The **College of Engineering** focuses its curricula on the engineering sciences (majors appear on pages 76-85). The **College of Letters and Science** provides curricula which enable the student to pursue fundamental knowledge and to learn basic intellectual disciplines which lead to a liberal education (majors are noted on page 89).

ENTRANCE REQUIREMENTS

The University's undergraduate admissions 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 a student good preparation for University work and reasonable freedom in choosing a special area of study.

Undergraduate entrance requirements are based upon these general principles but may vary, depending upon the type of admission you are seeking. Listed below are the requirements for all undergraduate admission categories.

ADMISSION AS A FRESHMAN

A Freshman Applicant is a student who has graduated from high school or who has earned a "Certificate of Proficiency" (see page 48), but has not enrolled in a regular session of any collegiate-level institution since high school—with the exception of a summer session immediately following high school graduation.

If you are a freshman applicant you must meet the following three basic requirements for admission:

- Subject Requirement, concerning the subjects you must take in high school
- Scholarship Requirement, concerning grades and averages in those required subjects
- Examination Requirement, concerning certain tests you must take before admission

Subject Requirements

(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
Three years of English—composition, literature, and oral expression. Not more than one will be accepted from the ninth grade.
- 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:** A total of 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 sci-

ence completed subsequent to the laboratory science used for "D" above.

The required courses listed above only constitute 10 or 11 of the 15 units required for admission to the University. The remaining units provide an opportunity for you to broaden your preparation for University work by taking elective courses in areas of your own interest.

If you are a California high school graduate, the courses used to satisfy the Subject Requirements must appear on a list that your high school principal has certified meet the course descriptions above, and has placed on file with the University's Director of Admissions. If you submit courses from an out-of-state school, the Office of Admissions will determine if your courses are acceptable in fulfillment of the Subject Requirements.

Scholarship Requirement

You must earn a minimum grade of C in each of the courses required for admission, but the overall average for those subjects on the list taken after the ninth year must be a B (3.0). If you are a nonresident applicant, your grade-point average in the required subjects must be 3.4 or higher.

In determining the required B 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 scholarship average. 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.

Examination Requirement

All freshman applicants must submit scores from the College Entrance Examination Board (CEEB) tests listed below. If you are applying for admission to the Fall Quarter, you should take the tests no later than



"This is one of the few remaining campuses where a student can have a traditional "College experience." It is a restful place, conducive to study, unlike the inner-city beehives so prevalent."

—Rhetoric instructor

January of your senior year. The following tests are required:

- Scholastic Aptitude Test (the verbal and mathematics scores you submit from this test must be from the same sitting)
- Three Achievement Tests, which must include (a) English Composition, (b) one from among the social studies or one from among the foreign languages, and (c) one from mathematics or one from among the sciences

If you are a California resident and your scholarship average in the required high school subjects is from 3.0 to 3.09 inclusive, you must earn a total score of 2500 or higher in these tests. If your scholarship average is 3.1 or higher, you must take the CEEB tests, but your scores will not be used to determine your eligibility. The test results may be used for counseling and, in some cases, for placement. A score of 600 or above on the English Composition Examination will exempt you from the Subject A requirement (see page 48).

Admission by Examination Alone

If you do not meet the scholarship and/or subject requirements for admission, you can qualify for admission as a freshman by your examination scores alone. To do so, you must take the same CEEB tests discussed above and receive a total score of at least 1100 on the Scholastic Aptitude Test, and at least 500 on each Achievement Test. If you are a California applicant, your total score on the three Achievement Tests must be 1650 or higher. If you are a nonresident applicant, your total score on the three Achievement Tests must be 1730 or higher.

Examination Arrangements: Make arrangements to take the required tests by writing to the Educational Testing Service, P.O. Box 1025, Berkeley, California 94701, or P.O. Box 592, Princeton, New Jersey 08540. (Test fees should be paid to the Educational Testing Service, not the University.) Your test scores will be regarded as official only if they are reported directly to the Admissions Office by the Educational Testing Service. Your final notification of admission cannot be released until your scores from the CEEB tests have been received by the Admissions Office.

ADMISSION TO ADVANCED STANDING

An advanced standing applicant is a high school graduate who has been registered in a regular or extension session of a college or university other than the University of California. 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. If you are a nonresident, you must also meet the additional requirements described at the end of this section. 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 units, you must also satisfy the examination requirements for freshman applicants.

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 were eligible for admission to the University as a freshman, 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.
- If you were not eligible for admission as a freshman only because you had not studied 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 twelve or more quarter or semester units of transferable college credit since high school graduation or have successfully passed the CEEB tests required of freshman applicants.

If you choose not to make up the subject deficiencies, you may become eligible for advanced standing admission by the following provision:

*The advanced standing requirements for admission listed here are experimental and will be in effect for applicants applying to terms from the Fall Quarter 1973 through the Spring Quarter 1977.



"If you're transferring to Davis from a community college, concentrate on fulfilling lower-division prerequisites—especially math and science."

- If you were ineligible for admission to the University as a freshman because of low scholarship or a combination of low scholarship and a lack of required subjects you may be admitted after you have earned a grade-point average of 2.0 or better in at least 84 quarter units (56 semester units) of college credit in courses accepted by the University for transfer.

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. A nonresident applicant who graduated from high school with less than a 3.4 grade-point average in the subjects required for freshman admission 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 two units of the required high school subjects waived.

SPECIAL PROGRAMS AND ADMISSIONS CATEGORIES

Educational Opportunity Program (EOP)

The Educational Opportunity Program assists educationally and economically disadvantaged students who are applying to the University. The program provides admission consideration, counseling, tutorial assistance, academic advising, and financial aid based on need.

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.

An application for admission to the Educational Opportunity Program at UC Davis may be obtained by writing to the Office of Admissions, 175 Mrak Hall, University of California, Davis 95616.

Second Baccalaureate

If you have a bachelor's degree substantially equivalent to that which 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 in this category to either the College of Agricultural and Environmental Sciences or the College of Engineering is extremely limited and requires the approval of the Admissions Officer and the dean of the respective college. You should write a preliminary letter explaining your goals to the dean of the college to which you seek admission before submitting a formal application. 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 Letters and Science.



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 pre-determined time of enrollment.

Admission to the College of Agricultural and Environmental Sciences or the College of Engineering is extremely limited and requires the approval of the Admissions Officer and the dean of the respective 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 Letters and Science.

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 of 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.

Intercampus Transfer

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 trans-

fer 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 \$20 must be submitted with your transfer application. Filing dates are the same as those listed for freshman applicants.

Applicants from Other Countries

Applicants from other countries will be admitted in accordance with the general procedures governing nonresident admission. You may request an application by writing the Admissions Office, 175 Mrak Hall, University of California, Davis, California 95616. If you are not a United States citizen or United States immigrant, you must return this application with a financial information form and the nonrefundable \$20 filing fee. It is a good idea to file your application at least six months before the beginning date of the quarter you wish to attend.

If your schooling has not been in English, you are requested to submit the results of the Test of English as a Foreign Language (TOEFL). Write to the Educational Testing Service, P.O. Box 592, Princeton, New Jersey 08540, to arrange a testing date and location in your home country.

Foreign students whose native language is not English may be asked 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, your admission will be delayed until you have acquired the necessary language skills.

As part of the application process, you are also required to submit your secondary and college 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 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 36). There are no grants, loans, or scholarships awarded by the University of California, Davis 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 31.

Concurrent Courses

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

For information, write the University Extension Office, 4445 Chemistry Addition, University of California, Davis 95616.

For admission to Graduate Status, see page 101.

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

For admission to the School of Medicine, see page 121.

For admission to the School of Veterinary Medicine, see page 125.

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 Office of Admissions, 175 Mrak Hall, University of California, Davis 95616.

A non-refundable application filing fee of \$20 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 the \$20 filing 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. After the first month, however, some departments and campuses may close to new applicants as enrollment quotas are filled. Once a department 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 Date of Filing Periods for New Applicants

Quarter to be admitted	Opening application date
Fall 1976	November 1, 1975
Winter 1977	July 1, 1976
Spring 1977	October 1, 1976
Fall 1977	November 1, 1976

Redirection

If at the end of the first month of the application filing period there are more qualified applicants than UC Davis can accommodate within its enrollment quotas, all applications will be reviewed and some applicants redirected to alternative campuses, according to the preferences listed in their applications.

When redirection is necessary, special procedures are used to select those students who will be admitted to the over-subscribed campus. Fifty percent of the available space is reserved for the students most qualified on the basis of scholastic achievement. The remaining fifty percent of available spaces are filled after an individual review of each application. The review takes into account such matters as academic interests, available campus programs, hardship factors, selective recruitment efforts, and special achievements and awards.

Duplicate Applications

Students should file an application on 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 Director of Admissions (University Hall, University of California, Berkeley 94720) which campus is your first choice. Fees submitted with duplicate applications cannot be refunded.

Transcripts

If you are in high school when you apply, please request that your high school send directly to the Office of Admissions an official transcript of all work completed through your junior year. 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.



"You can't know beforehand how successful you will be at the University. But if you are admitted, chances are that you won't have any serious difficulty."

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

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 at the Office of Admissions.

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 the Director of Admissions (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 on my preferred campus?
- Will I be admitted to the University?

Our notification procedures answer these questions in order. First, you will be mailed a card acknowledging receipt of your application. Then, you will receive a second card advising you of the campus where your application is being considered. Finally, you will receive a letter confirming your eligibility for admission.

The length of time before admission notification varies, depending on the individual circumstances of your application. Most applicants for Fall Quarter will receive final notification by late spring.

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 test scores to be sent to the

Office of Admissions as soon as they are available. Because advanced standing eligibility depends upon the final outcome of quarter or semester course work in progress, the Office of Admissions must receive a final transcript of all work completed before you may register.

Included with your letter of acceptance of admission will be the "Statement of Intention to Register" form. Please complete this form and return it with the required non-refundable \$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 are not required to pay the \$50 deposit.

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 an appropriate level of ability in English composition. This requirement is known as "Subject A" and may be satisfied by:

- Achieving a score of 5, 4, or 3 on the CEEB Advanced Placement Examination in English;
- Achieving a score of 600 or higher on the CEEB Achievement Test in English Composition; or
- Completing an acceptable 4-quarter unit or 3-semester unit college course in English composition with a grade of C or higher.

If you do not meet the requirement in one of these ways, you must satisfy this requirement as described on page 60.



Advanced Placement Examinations

The Advanced Placement Examinations of the College Entrance Examination Board are taken in conjunction with courses taken in high school. You will receive ten quarter units of University credit for each examination 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.

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 degree. 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 course work.

Credit from Another College

The University gives unit credit to transfer students for courses they have taken at other 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.

Many students who plan to earn a degree at the University find it to their advantage to complete their freshman and sophomore years at a California community college. Each community college offers 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.

ADMISSIONS CHECKLIST

- 1. Obtain the undergraduate admissions packet from your high school, local community college, or the Office of Admissions, 175 Mrak Hall, University of California, Davis, California 95616.
- 2. Complete Part A and Part B of the application, listing the college and major you prefer. Include your essay and a check or money order for \$20 with your application forms and return them to the Admissions Office *during the first month* of the filing period for the quarter you wish to enter.
- 3. Request that transcripts, including work in progress, be sent from those schools required by your type of application. If test scores are required, please arrange to have these forwarded by the testing agency.
- 4. Receive from the Office of Admissions a card acknowledging receipt of your application.
- 5. Receive from the Office of Admissions a card notifying you of the campus where you will be admitted, provided that you meet the entrance requirements for your category of admission.
- 6. Receive from the Office of Admissions 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, and test scores (if required), so it is important to make these arrangements if you want to avoid delayed notification.
- 7. Receive from the Office of Admissions a notification of admission and "Statement of Intention to Register" form.
- 8. Return your "Statement of Intention to Register" with a nonrefundable fee of \$50 (if required).



Academic Information

WHEN YOU ARRIVE

Starting off on the right foot at UCD is made a little easier by various programs designed to ease your introduction 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, and complete your registration. You will also be able to meet students, professors, and staff members and get some advice about majors, requirements, social life, and any other 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.

To be classified as a full-time student or to compete in intercollegiate athletics, you must carry a minimum study list of 12 units. You must also satisfy the maximum and minimum unit load for students in your particular college or school.

If you have not satisfied the Subject A requirement, you must enroll in the Subject A course (see page 60). 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.*

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

- Submit a Statement of Residence (see page 311).
- 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.

\$50 Reduced Fee Program

If you are an undergraduate student enrolled for less than nine units in any quarter (including non-credit courses, e.g., Subject A) you may petition for a \$50 reduction in the Education Fee. Petitions are available at the Part-Time Degree Program Office and must be filed with the Registrar no later than the tenth day of instruction.

Adding or Dropping Courses

You must file an Add/Drop Petition in order to add or drop courses after your initial enrollment in classes. You should file the completed petition at 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 College and School sections for more information.)

Change of Name

Petitions for this purpose may be obtained from the Registrar.

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.

Reentry after an Absence

If you are a former student planning readmission into 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. (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 1976	August 13, 1976
Winter 1977	November 19, 1976
Spring 1977	February 14, 1977
Fall 1977	August 12, 1977

If you have been receiving veterans' benefits you must report your change of status immediately, in person or by mail, to the Veterans Affairs Office.

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 difficulty.

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

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.



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.

A fee of \$20 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 when he or she returns.

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, located in North Hall.

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 (including medicine and veterinary medicine 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, Education Fee, University Registration Fee, and other student fees. The effective date for determining a refund of fees is the date the student files an official notice of withdrawal with the University, and it is presumed that no University services will be provided to the student after that date.

Tuition, Educational Fee, University Registration Fee, 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%

Scholastic Requirements

The 1976-77 academic year will consist 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 21).

Credit for academic work in the University is evaluated as 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

*If no credit for courses is received, a full refund of the Registration Fee for the regular session will be granted to all students entering the armed forces prior to the sixth week of the quarter. No refund thereafter.



"A quarter (10 weeks) is a comparatively short school term and it takes some endurance on your part to deal with such intensity. It's not unusual to read 5 full-length books for a class in that short amount of time."

—Senior, Rhetoric

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 his or her 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
- NP, not passed
- S, satisfactory
- U, unsatisfactory

The grades A, B, C, 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 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 57).

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 at times published in the *Class 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 (see page 56).

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 for graduation credit 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 additional conditions or restrictions.

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 fail to complete a course they undertook for a letter grade, and who received an Incomplete, 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. Petitions are available from the Graduate Division and must be signed by your graduate adviser. (See page 130 for Special Study Courses.) Courses in which a D or F are received may *not* be repeated with the S/U option.

*"I think there are a lot of people who come here as a stepping-stone along the way to some final ambition . . . and never leave."
—Administrator*

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 130 for Special Study Courses.)

In Progress (IP) Grading

For a course extending over more than one quarter (designated "deferred grading only, pending completion of the 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 satis-

factorily complete the course work as specified by the instructor. *An I grade must be replaced before the end of the third succeeding term of the student's academic residence.* Courses for which an I grade has been assigned may not be repeated except on an audit basis. A student whose record shows more than 16 units of I grades will be subject to disqualification (see page 57).

Incomplete grades will not be included in your grade-point average at the end of a quarter. However, at the time of graduation, any remaining I grades are included in the computation of the grade-point average, in order to determine whether you have achieved the 2.0 grade-point average required for the bachelor's degree. *An Incomplete grade, in these computations, has the same effect as a grade of F.* Therefore, it is recommended that students do 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.



Repetition of Courses

A 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, however, the *units* completed will be credited towards the degree only once. Repetition of a course more than once requires approval by the appropriate dean in all instances. Courses in which a student has received a grade of D or F must be taken for a letter grade if repeated—not on a P/NP basis.

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 for a current term 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.

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.

Final examinations are mandatory in all undergraduate courses except independent study courses, courses which consist of laboratory work only, and courses for which the final examination has been waived by the Academic Senate. On courses which have the final examination waived, the course description will include the statement, "no final examination." (See page 98 for final examination regulations in the College of Letters and Science.)

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. A petition and a copy of the prescribed conditions may be obtained 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.

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 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, 4445 Chemistry Addition. 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 -

The minimum number of quarter units needed for a bachelor's degree in the University is 180. Specific unit requirements for the various colleges and schools are outlined in their respective sections.

PROBATION AND DISQUALIFICATION

The following provisions apply to all undergraduate students in the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science.

Students shall be placed on probation for failure to meet qualitative and/or quantitative standards of scholarship. The *qualitative standards of scholarship* require that students maintain a C average (2.0) or better for all work undertaken in the University and for the work undertaken in any one term. The *quantitative standards*, referred to as "minimal progress requirements," define satisfactory scholarship in terms of the number of units that must be completed. Minimal progress requirements do not apply to students enrolled in the Division of Extended Learning's Part-Time Degree Program or to students who have their college dean's approval to carry less than a minimum program because of medical disability or employment.

The following courses will count toward unit minimums.

- Non-credit courses, e.g., Subject A, shall be

evaluated according to the "Carnegie Unit" rule and counted as units passed

- Courses repeated to improve "D" grades
- Courses taken in Summer Session at UC Davis or at another accredited school and transferred to UCD
- Courses passed by examination in accordance with policies established by the Divisional Committee on Courses

The faculty of an individual school or college may authorize a student who is subject to disqualification to continue on probation.

To transfer from one campus of the University to another, or from one college or school to another on the same campus, a student who has been disqualified or is on probation must obtain the approval of the dean whose jurisdiction he or she is seeking. After making the transfer, the student is subject to supervision by the faculty of the new college, school, or campus.

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 or subject to disqualification from further registration at the University:

	Probation	Subject to Disqualification
If, at the end of any quarter, a student's grade-point average is <u>less than</u> . . .	2.0 (but not less than 1.5) for the term; <u>or</u> less than 2.0 for all courses taken within the University of California.	1.5 for the term; <u>or</u> if the student has more than 16 units graded I (Incomplete); <u>or</u> completed two consecutive quarters on probation.
If, during a student's first three quarters at UCD, units completed are <u>less than</u> . . .	36 (but more than 30).	30.
If, at the end of a student's fourth quarter at UCD, or thereafter, units completed are <u>less than</u> . . .	12 for the term; <u>or</u> less than 40 (but more than 34) in three consecutive quarters, commencing with the student's fourth quarter.	34 in three consecutive quarters, commencing with the student's fourth quarter.

College Entrance Examination Board (CEEB) Advanced Placement Examination Credit

You earn 10 quarter units of credit toward the 180-unit bachelor's degree requirement for most CEEB Advanced Placement Examinations satisfactorily passed, usually during the junior or senior year in high school. (A total of 5 units is awarded for a score of 5, 4 or 3 earned in the Mathematics AB examination.)

You may not earn University credit for courses which duplicate credit already allowed for advanced placement examinations (see UCD Course Equivalencies column below; see under Remarks for exception to biology and chemistry). 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 chart below details course equivalencies for credit allowed toward graduation. (In the College of Letters and Science these courses would be counted toward the breadth credit requirement; students in the College of Engineering may direct questions to their Dean's Office, and students in the College of Agricultural and Environmental Sciences should consult with their advisers.)

EXAMINATION	SCORE	UCD COURSE EQUIVALENCIES	CONTINUING COURSE	DEGREE CREDIT ALLOWED	REMARKS
English English	5, 4, 3	English 1 and 3		Humanities 4 units	Partial satisfaction of Letters and Science requirement.
Foreign Languages French	5, 4, 3	French 6	French 30A or any upper-division literature course.	Humanities 4 units	
German	5, 4, 3	German 4, 6A or 6B	Any upper division course; German 101 strongly recommended.	4 units	The Foreign Language Requirement for the College of Letters and Science is satisfied by a score of 5, 4 or 3 on any language examination.
Latin (Vergil)	5, 4, 3	Latin 103	Determined by consultation with Classics adviser.	4 units	
(Lyric)	5, 4, 3	Latin 105	Determined by consultation with Classics adviser.	4 units	
Spanish	5, 4, 3	Spanish 6	Spanish 27A; 101A may be taken concurrently.	4 units	
Humanities Art Studio	5 4	Art 2, 5 Art 2	Art 3 Art 3 or 4	Humanities 8 units 4 units	
Art History	5, 4 3	Art 1A, 1B, 1C Art 10		10 units 4 units	
American History	5, 4, 3	History 17A, 17B		8 units	Satisfies American History and Institutions Requirement.
European History	5, 4, 3	History 4B, 4C		8 units	
Music	5, 4, 3	Music 27A, 27B		4 units	
Natural Sciences Biology	5, 4	Biological Sciences 1, Botany 2, Zoology 2	Any appropriate upper-division course in the biological sciences, Bacteriology 2, Botany 2 or Zoology 2.	Natural Sciences 10 units	Student has option of taking Botany 2 and Zoology 2 for full credit.
	3	Biological Sciences 1	Bacteriology 2, Botany 2 or Zoology 2.	10 units	
Chemistry	5, 4, 3	Chemistry 1A, 1B	See "Remarks."	10 units.	Credit for Chemistry 1A and 1B equivalence may serve as prerequisite to 1C with instructor's consent; 1A and/or 1B may, however, be taken for full credit.
Mathematics	AB 5, 4, 3	Mathematics 11, 21A	Mathematics 21B	4 units	Students who achieve a score of 5 or 4 may, with the consent of the instructor, enroll in 21C.
	BC 5 4, 3	Mathematics 11, 21A, 21B	Mathematics 21C	8 units	
Physics	B5	Physics 10, 2A, 2B, 2C, or 5A, 5B, 5C	Determined by consultation with Physics adviser.	10 units	No credit for laboratory parts of Physics 5, 4 or 3. Course equivalents may be used as prerequisites for succeeding courses of same series by consent of instructor. Any course equivalent may be taken for full credit with consent of instructor and curriculum committee, but probably disallowed if high score achieved on examination.
	B4, 3	Physics 10		10 units	
	CI 5	Physics 2A, 4A, or 5A		4 units	
	CII 5	Physics 2B, 4C, or 5B		4 units	
	CI 4	Physics 2A or 5A		4 units	
	CII 4	Physics 2B or 5B		4 units	





STUDENT RESPONSIBILITY

Each student is responsible for compliance with the announcements and regulations printed in this Catalog and in the *Class Schedule*, with all official notices posted on bulletin boards and 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. These regulations are available from the Office of the Vice Chancellor—Student Affairs (541 Mrak Hall), and the Coordinator of Student Con-

duct (462 Memorial Union). The Standard of Conduct is outlined in the booklet *University of California Policies Relating to Students and Student Organizations, Use of University Facilities and Nondiscrimination*.

Misconduct for which students are subject to discipline includes, but is not limited to, cheating, plagiarism, forgery, alteration or misuse of University documents, records, or identification, or knowingly furnishing false information to the University. Disciplinary sanctions which may be involved range from a warning to separation from the University.

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, Student Judicial Board, the Coordinator of Student Conduct, or another appropriate officer. The President of the University, through the Chancellor, has ultimate authority for the administration of student discipline.

HONORS AND PRIZES

Deans' Honors List

The Deans' Honors List, posted quarterly on bulletin boards outside College Offices, lists the names of students who have completed work through the previous quarter at the University with distinction.

Students in the College of Engineering who have completed a minimum of 12 units of work and who have achieved a 3.2 cumulative grade-point average or better in all work undertaken in the University and in their college, will have their names included on the list.

In the Colleges of Letters and Science and the College of Agricultural and Environmental Sciences, undergraduates who have completed a minimum of 12 units of work at the Davis campus, exclusive of units taken on a Passed/Not Passed basis, and who have achieved a minimum grade-point average of 3.3 during the preceding term, will have their names on the Deans' Honors List.

Graduation Honors

Graduating students may qualify for honors, high honors, or highest honors in the College of Agricultural and Environmental Sciences and College of Engineering, and for honors and highest honors in the College

of Letters and Science. This notation is made on your 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.

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 departmental requirements.

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

UNIVERSITY REQUIREMENTS

Subject A: English Composition

The Subject A Requirement is based on the belief that a University student must demonstrate an acceptable level of ability in English composition to succeed in college-level work. Satisfaction of this requirement is a prerequisite to all other undergraduate courses in English composition.

The requirement may be met in one of the following ways:

- By achieving a grade of 5, 4, or 3 in the College Entrance Examination Board (CEEB) Advanced Placement Examination in English.
- By achieving a score of 600 or higher in the CEEB Achievement Test in English Composition.
- 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 writing a superior essay on the Subject A Diagnostic Essay Examination. This examination can be taken only once. The Subject A exam is offered during the Summer Advising sessions and during Orientation Week each quarter. Consult the "Official Notice" posted prior to the beginning of the quarter for times and locations of the Orientation Week examination. Students who score below 450 on the (CEEB) Achievement Test in English Composition are not eligible to take the Diagnostic Essay Examination.

Satisfaction of the Subject A requirement is determined by the Office of Admissions. If you do not meet the requirement in one of the ways described above, you must enroll in the non-credit course in Subject 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:
 - Economics 111
 - History 17A, 17B, 21A, 21B, 27A, 27B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 175C, 176A, 176B, 177, 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, 109A, 109B, 113, 127, 128, 160, 163

(Students taking courses are subject to the rules that apply for prerequisites and majors.)

- 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 achieving a score of 3 or higher on 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 Political Science departmental 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, 227 Voorhies 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 and College of Engineering. Consult the appropriate section of this catalog for details. 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 he or she 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 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 he or she plans to receive the degree. The dates for filing are published in the calendar on page 8 of this catalog and in the *Class Schedule and Room Directory*.



College of Agricultural and Environmental Sciences

Information:
Dean's 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 more than 35 majors 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.

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

characteristic of faculty and administrative concern, not only with providing good teaching, but 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 to provide opportunities to explore the usefulness of your training 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, indicate 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 evaluates the success of its programs by distributing and collecting questionnaires in certain classes to determine immediate student reactions to these courses. 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 decision you make in this process is the selection of your career and/or 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 prior to 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 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 appear 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 examinations or courses. Courses may also be challenged by examination (see page 56).

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 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 existence under control, a small "assist" may be needed 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.

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 normally will spend a year or two in the Exploratory Program. In this case, you are assigned 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 you meet your 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 educational objectives.

General advising on academic programs is available at the College's Academic Advising Office, 129 Hunt Hall, where all advising activities in the College are coordinated.

Peer Advisers

Student advisers are available in the College's Academic Advising Office, 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 offices for action.

Associate Deans of Resident Instruction

The College has associate deans responsible for each of the following subject areas: Animal Sciences; Applied Economic and Behavioral Sciences; Biological Sciences; Plant Sciences; Resource Sciences and Engineering; Food, Nutrition and Consumer Sciences; and Pest and Disease Management. They welcome the opportunity to become acquainted with individual students and talk informally with them. They can also help you with academic problems if you are placed on probation or subject to dismissal.

Orientation Classes

Each quarter the College offers an orientation class (see page 265) 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 the selection of 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 descriptions for each of its course offerings. These descriptions are available each quarter to assist students in course selection. 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, College offices, advisers' offices, departmental offices, The First Resort, and in the dormitories at the head residents' offices.

Work-Learn Opportunities

It may seem that the career you are preparing for is far removed from the courses you are taking. It is sometimes difficult to see the usefulness and importance of various courses, or to know which of them may lead to potential career possibilities. Work-learn experience may assist in removing doubts about your chosen career, increase your motivation, and add to your value in the job market.

The Bixby Work-Learn Program provides opportunities in many fields for which the College prepares students. This voluntary program provides supervised internships—full-time or part-time—in the summer or in any quarter of the academic year. Visit or write the Bixby Work-Learn Office or the Campus Work-Learn Center (see page 22).

To facilitate credit for work-learn internships, the College has initiated an internship course, Work-Learn 192 (see page 307). By planning in advance with a sponsoring faculty member, you can take up to 15 units per quarter of work-learn experiences that follow appropriate academic processes and include methods of evaluation.

Field-work internships are also possible through courses in Applied Behavioral Sciences and environmental management internships in Environmental Studies.

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 is noted on your transcript. Requests for certification of multiple majors between colleges should be made to the College Office.

ANIMAL SCIENCES—M. Ronning, Associate Dean
College Office, 228 Mrak Hall, 752-6970

Majors in Animal Sciences:

Animal Science Wildlife and Fisheries Biology
Avian Sciences

Individual or Interdisciplinary Majors and Programs:

Agricultural Science and Management
Exploratory (non-degree program)
Individual Major

APPLIED ECONOMIC AND BEHAVIORAL SCIENCES—E. J. Blakely, Associate Dean
College Office, 228 Mrak Hall, 752-6360

Majors in Applied Economics:

Agricultural Economics Development, Resource
and Business and Consumer
Management Economics

Majors in Behavioral Sciences:

Agricultural Education Human (Child)
Applied Behavioral Development
Sciences Native American
Design Studies

BIOLOGICAL SCIENCES (an Intercollegiate Division)—James E. Devay, Associate Dean of the Division
Division Office, 150 Mrak Hall, 752-0391

Majors in Biological Sciences:

Bacteriology Genetics
Biochemistry Physiology
Biological Sciences Zoology
Botany

FOOD, NUTRITION AND CONSUMER SCIENCES—John R. Whitaker, Associate Dean
College Office, 228 Mrak Hall, 752-6971

Majors in Food Sciences:

Fermentation Science Food Science
Food Biochemistry

Majors in Nutrition:

Community Nutrition Nutrition Science
Dietetics

Majors in Consumer Sciences:

Consumer Food Science Textiles
Home Economics

PLANT SCIENCES, AND PEST AND DISEASE MANAGEMENT—J. M. Lyons, Associate Dean
College Office, 228 Mrak Hall, 752-0819

Majors and Programs in Plant Sciences:

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

Majors in Pest and Disease Management:

Entomology

Interdisciplinary Programs:

Agrarian Studies International Agricultural
Development

RESOURCE SCIENCES AND ENGINEERING—
D. R. Nielsen, Associate Dean
College Office, 228 Mrak Hall, 752-0110

Majors in Resource Sciences:

Atmospheric Science Environmental Toxicology
Environmental Planning Renewable Natural
and Management Resources
Soil and Water Science

Majors in Engineering:

(See College of Engineering, page 73)



"You have to be
creative and willing
to experiment to
succeed."

—Freshman,
Biochemistry

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 best suited to meet your needs*. You should not expect to stay in the program more than two years, however, as it may delay graduation. For registration purposes, indicate *Exploratory* on your admissions materials and study list cards.

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 involves 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 an

adviser or a group of advisers. *The proposed program must be submitted to a special committee for review at least four quarters before you plan to graduate*. This proposal must include a description of your special educational aims and a list of planned courses.

Examples of some individual major programs developed recently by students are: Business Management and Human Relations, Creative Therapeutic Recreation, Family Development, Geobotany, Health Sciences, Human Ecology, Hydrometeorology, Physical Therapeutic Science, Plant Pathology, Psychobiology, Recreation Planning, Social Criteria for Environmental Design, The Child in Society, Vocational Therapy, Youth Guidance and Counseling, and Zoo Management.

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. (See also page 110.)

Preprofessional training requirements for application to professional schools, such as the 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, 224 South Hall; or the Pre-Law Advising Office, 216 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 107.



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 the faculty: not more than 6 units of the required total of 180 units may be Physical Education 1; at least 8 units must be in English and/or Rhetoric courses that emphasize written or oral expression; and 54 units must be upper-division work.

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 economics and business management major than they would to a biochemistry major.) Your faculty adviser has guidelines for each major showing what courses you should consider.

COLLEGE POLICIES AND PROCEDURES

Study List

The study list is a record of the courses in which you enroll during a particular quarter. It should be part of a grand 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, and (c) a proper balance between the demands of the course and your ability to master the subject matter.

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.

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.

Probation and Disqualification

Students are expected to make reasonable progress toward the degree requirements. You must pass at least 36 units during your first three quarters at Davis and at least 40 units subsequently during any three consecutive terms or you will be placed on probation or subject to disqualification. (See page 57 for details.)

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 54 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 major requirements.

Credit by Advanced Placement Examinations

See page 58.

Transfer Students

If you transfer to the College of Agricultural and Environmental Sciences 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 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 page 66) and/or plan a visit to the campus to discuss your program with a faculty adviser.

The minimum grade-point averages required to qualify for these honors are shown in the following table:

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	

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 minimum grade-point average of 3.3 for that 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.

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 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 are in need of financial support. (See also the Scholarship section, beginning on page 38.)





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.

Fourteen 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.

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.

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, Master of Science, Doctor of Engineering, and Doctor of Philosophy degrees, or Graduate Certificate Programs, see page 85.

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 42. 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	1/2
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.

Admission to Advanced Undergraduate 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. On the average, engineering transfer students from the community colleges perform at virtually the same academic level as those who began at Davis as freshmen. 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, see the Admissions section.)

If you are admitted with *less 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 page 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 subjects specified in the following table 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 (analytic geometry, 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 (included are 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
Humanities-social sciences (must be selected from a list of course groups approved by the Committee on Undergraduate Study, and must include the equivalent of English 1 and either Rhetoric 1 or 3)	16

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

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.

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 successful flexibility 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 20 to 25 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 select your own adviser and to change advisers whenever you have an alternative preference.

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 (including Forest Engineering option)

Chemical Engineering
 Civil Engineering
 Electrical Engineering (including Computer Science option)
 Materials Science and Engineering
 Méchanical Engineering
 Individual Engineering
 Agricultural Engineering/Materials Science and Engineering
 Chemical Engineering/Materials Science and Engineering
 Civil Engineering/Materials Science and Engineering
 Electrical Engineering/Materials Science and Engineering
 Mechanical Engineering/Aeronautical Engineering
 Mechanical Engineering/Materials Science and Engineering

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

Engineering students may enroll in other combinations of engineering majors or in an engineering major and a non-engineering major of their own choosing. Such double-major students must satisfy the requirements for both majors. Recent informal double majors have included: Civil Engineering/Mechanical Engineering, Electrical Engineering/Mechanical Engineering, Chemical Engineering/Chemistry, Civil Engineering/Geology, Electrical Engineering/Mathematics, Electrical Engineering/Philosophy, and Electrical Engineering/Physics. Degree requirements for informal double majors ordinarily cannot be completed within 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, Student Development Office, 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 Engineering 1 (*Introduction to Electrical Engineering*)
- Mechanical Engineering 1 (*Mechanical Engineering*)

PLANNING A 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 74.

The minimum number of required units ranges from 180 to 195, depending on the curriculum. Programs normally require 12 quarters of study averaging 15 units per quarter. You cannot enroll for less than 12 units, exclusive of physical education, without special approval from the Dean of the College. 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 57 for regulations concerning the minimum rate of progress.

Sample arrangements that list the Lower Division and Upper Division Programs in a quarter-by-quarter se-

quence may be found in the *College of Engineering Bulletin*, available in the Engineering Undergraduate Office.

Program Flexibility

In the Lower Division Program for all curricula except Chemical Engineering, only mathematics, Physics 4A and 4C, 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 help the instructor establish a starting point for a given course. The prerequisites for any course can 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)
- Subject A (if not yet otherwise satisfied)
- Other (Engineering 3 or 4, English 1, Chemistry 1A or 4A, Rhetoric 1 or 3, or other humanities-social sciences electives)

If you plan to graduate, or are considering the possibility of graduating, under the Chemical Engineering or the Chemical Engineering/Materials Science and Engineering curricula, 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.

Work-Learn Programs: Engineering 92 and 192 courses are designed to provide internship experience under the Work-Learn Program (see page 22). Further information is available from your adviser, the College Undergraduate Office, or the Work-Learn 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 OF ENGINEERING 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 181.

You may, for good cause, request a waiver 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.

RESIDENCE REQUIREMENT

Of the total units required for the Bachelor of Science in Engineering degree, at least the final 45 units characteristic of your curriculum must be completed while you are registered in the College of Engineering.

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 develops 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, physics, or mathematics.

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

Bacteriology 2	Geology 1, 1L
Biological Sciences 1	Mathematics 22A, 24
Botany 2	Physics 4B, 4D
Chemistry 1C or 4C, 5, 8A, 8B	Physiology 2
Genetics 100A	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 31 quarter units from subjects in the humanities and social sciences. English 1, and either Rhetoric 1 or 3, must be included in those 31 units. If you score 5, 4, or 3 on the CEEB Advanced Placement Examination in English, you will receive credit for English 1 and six additional units of humanities-social sciences electives.

A wide latitude is allowed in selecting your remaining 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 subject areas (exceptions noted) are suitable as Humanities-Social Sciences electives. If you repeat any of the courses which may be repeated for credit, not more than 4 units in any one such course can be counted toward your Humanities-Social Sciences requirement.

Afro-American (Black) Studies
Agrarian Studies
American Studies
Anthropology (except 13)
Applied Behavioral Sciences (except 141)
Art
Asian American Studies
Classics
Comparative Literature
Dramatic Art (except 30, 124A, 124B, 124C, 124D, 180)
Economics (except 11A, 11B, 12, 103)
Education (except 100, 114)
English (except 25, 26, 119)
Foreign Languages
Geography (except 1, 3, 4, 102, 105, 106, 107, 108, 110, 111, 112, 162)
History
Human Development
Integrated Studies
Linguistics
Music (except 1)
Native American Studies
Philosophy (except 12A, 12B, 134)
Political Science
Psychology (except 103, 107, 108, 129, 131)
Rhetoric
Sociology (except 46A, 46B, 106)

"The late 70's is an especially competitive time for college students. Just getting admitted to UCD is competitive. But if you've been accepted here, that says something for your own promise."

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, 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 Special-Study courses (Engineering 199) up to a maximum of 5 units for each separate project, and for internships (Engineering 192), up to a maximum of 5 units per quarter. A total of not more than 6 units of 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 54.)

While registered in the College of Engineering, you may enroll in only one course per quarter in which you choose the Passed/Not Passed (P/NP) grading option. Courses that are graded Passed/Not Passed *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 (including English 1 and Rhetoric 1 and 3), technical electives, and unrestricted electives may be taken on a Passed/Not Passed basis. All others (including required courses and basic science and mathematics electives) must be taken on a letter-grade basis.

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

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:

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 121, 161, 162, 165, 166, 172
- Civil Engineering 131A, 131B, 138
- Electrical Engineering 150, 157A, 157B
- Applied Science 115
- Engineering 148, 190

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.

Suggested technical electives:

Mechanical Engineering 121, 161, 162, 172
Civil Engineering 131A, 131B
Electrical Engineering 157A, 157B
Applied Science 115
Engineering 106, 160, 190
Environmental Studies 102

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, soil-management, and environmental aspects of agriculture, 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 either develop a broad program or to specialize in one or more of the areas described below. The suggested technical electives listed for each area of specialization include only courses that would enhance your knowledge in that particular area. The lists are not intended to be restrictive or all-inclusive.

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 132
Biochemistry 101A, 101B
Chemistry 5, 8A, 8B, 107A, 107B
Chemical Engineering 151
Electrical Engineering 150
Engineering 103B, 105B, 111
Food Science and Technology 104, 108, 111, 131, 150
Mechanical Engineering 165, 166

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
Agricultural Engineering Technology 111
Civil Engineering 141, 142, 144
Engineering 111
Water Science 103, 104, 110A, 110B, 141, 150, 154, 160, 172

Packaging and Handling concerns the study of 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, 132
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
Civil Engineering 131A, 132A
Engineering 102B, 104B, 111, 122, 140
Mechanical Engineering 121, 150, 151, 152, 155

Structures and Environment is an area that centers on 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. Agricultural wastes management, environment modification, and micrometeorology are studied.

Suggested technical electives:

Agricultural Engineering 125
Agricultural Engineering Technology 111
Atmospheric Science 20, 123, 124, 131, 133
Civil Engineering 131A, 131B, 132A, 132B, 132C, 134, 142, 147, 148A
Mechanical Engineering 166
Physiology 100A, 100B, 149

The Forest Engineering Option involves 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 examine systems and equipment for forest production and harvesting, reforestation, forest waste management, forest recreational development, soil and water control and conservation, as well as forest road system development, materials handling in the forest and at the sawmill, and other phases of forestry. This option is administered in cooperation with the Department of Forestry and Conservation 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 in Plumas County.

Suggested technical electives:

Agricultural Engineering 116
Agricultural Engineering Technology 111

Geography 161
Resource Sciences 100
Water Science 141
Forestry 105, 123A, 123B (at Berkeley)
Wood Science and Technology 131 (at Berkeley)
Any elective listed under Forest Engineering Option 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 18 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, 116; Chemical Engineering 159; and Mathematics 24, 118A,

118B, 118C, 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.

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 101A, 101B; Biological Sciences 1; Genetics 100A, 115; Physiology 110A, 110B, 110C; Zoology 2, 100

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 101A, 101B; Biological Sciences 1; Physiological Sciences 101A, 101B, 110A, 110B, 111A, 111B

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 123

Food Science and Technology 104, 104L, 106, 113, 130, 198

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 24, 118A, 118B, 118C, 119, 127A, 127B, 127C, 128A, 128B, 128C, 130A, 130B, 132A, 132B, 185A, 185B

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

Suggested technical electives:

Engineering 111, 111L, 160, 162

Agricultural Engineering 112

Mechanical Engineering 161, 162, 163



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 133, 160, and 166; Political Science 108, 109A, 109B, 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 and 116, 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, 143A, 152, 153, 161, 162

Economics 125A, 125B, 130, 131
Electrical Engineering 118
Engineering 106
Environmental Studies 112, 133, 160, 166, 168
Geography 106, 155, 162
Geology 134
Mathematics 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, 122, 123
Bacteriology 102, 130A
Biochemistry 101A, 101B
Chemical Engineering 154A, 154B, 156A, 156B
Chemistry 8A, 107A, 107B, 110A, 110B
Civil Engineering 143A, 143B, 145, 147, 148B, 149, 152
Engineering 160
Environmental Studies 140, 150A, 150B, 150C, 162, 166

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 laws of solid and fluid mechanics and hydraulics to predict the performance of foundations, earth structures, etc.

Suggested technical electives:

Agricultural Engineering 125
Applied Science 115
Art 121A, 121B, 121C

Civil Engineering 131B, 132C, 134, 137, 138, 139,
162, 173, 175
Engineering 104C, 122, 148, 180
Mathematics 128A, 128B, 128C

Transportation Planning and Engineering: Specialization in this area is concerned with the development, coordination, operation, and maintenance 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 engineering blends knowledge of many engineering disciplines in the design, construction, operation, and maintenance of transportation facilities from the systems point of view. 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, 155
Agricultural Engineering 112, 119
Applied Behavioral Sciences 151A
Civil Engineering 137, 149, 152, 153, 161, 162
Economics 125A, 125B, 130, 131
Electrical Engineering 112A, 112B, 157A
Engineering 106, 115, 160
Environmental Planning and Management 110
Environmental Studies 112, 160, 162
Geography 106, 155, 156
Geology 134
Mathematics 131A, 131B, 131C
Mechanical Engineering 134
Political Science 102, 182, 186
Sociology 143

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

Chemistry 5
Civil Engineering 143A, 143B, 144, 145, 148B, 153,
177
Electrical Engineering 112A, 150
Environmental Studies 140, 150A, 185
Geography 162
Political Science 108
Water Science 103, 110A, 150, 160

ELECTRICAL ENGINEERING

Present-day Electrical Engineering embraces a broad spectrum of disciplines based upon the physical and mathematical sciences. Electrical Engineering encompasses such diverse fields as automation and control, information processing and computers, micro-miniaturization of circuits and components, instrumentation, communications and microwaves, and stimulated energy emission by means of quantum effects (masers and lasers). Work in these fields is being applied to medicine, communications, transportation, education, and business.

The variety of course offerings in the department permits you to prepare for graduate study in Electrical Engineering, or for a career as a practicing engineer. In the Electrical Engineering curriculum, close correlation between theory and practice is emphasized.

The program of study in electrical engineering allows maximum flexibility to pursue studies in a wide range of topics. Required courses insure attainment of a broad background in electrical engineering. The engineering core courses for the lower division provide a strong foundation for the specialized topics to follow. In addition, a specified group of upper-division courses in electromagnetic field theory, systems, and solid-state electronics prepares you for the technical electives of your choice.

There are two options within the Electrical Engineering program, the Electrical Engineering Option and the Computer Science Option, each with its own set of upper-division required courses

The technical electives are a substantial part of the Upper Division Program. They may be used to attain a broad background or to develop one or more areas of specialization. Since Electrical Engineering is a continuum of knowledge, it is difficult to define discrete areas of specialization. However, the following list may suggest some possible ways of combining the technical electives.

AREAS OF SPECIALIZATION:

Biomedical Engineering applies engineering concepts to the measurement of biological systems, the processing of biological data, and the description or modeling of biological processes. The field encompasses the design and operation of instruments used in biology and medicine.

Suggested technical electives:

Biological sciences, chemistry courses, and a broad spectrum of engineering courses that emphasize communications and control.

Computers are an increasingly important part of modern life. Electrical Engineering students study the theory, design, and application of computing systems. Some important sub-specializations are computer organization, digital systems design, software systems, automata theory and formal languages, and artificial intelligence.

Suggested technical electives:

Computers, digital systems, programming languages, and mathematics courses in numerical analysis and logic.

High-Frequency Phenomena and Devices deals with the study of the generation and transmission of high-frequency electromagnetic waves, including those at optical frequencies, and the interaction of these waves with matter. It also includes the design of useful devices based on these interactions.

Suggested technical electives:

Electromagnetics, solid state electronics, physics, and mathematics.

Information and Control is concerned with the transfer and processing of information and the use of information to control processes. A knowledge of the transfer of information is basic to understanding modern communications such as radio, television, and deep space telemetry. The principles of control underlie industrial automation and the control of vehicles.

Suggested technical electives:

Control, communications, electromagnetics, computers, digital systems, and mathematics.

Solid-State Devices and Physical Electronics is the study of electrons in the presence of electric and magnetic fields and of quantum electronic effects. Among the devices included are bipolar and field effect transistors, diodes, vacuum tubes, lasers, masers, traveling wave tubes, and superconducting Josephson junctions.

Suggested technical electives:

Solid-state electronics, electromagnetics, physics, and mathematics.

Systems and Circuits encompasses a large body of engineering knowledge. A study of systems includes engineering and non-engineering systems such as sociological and economics systems. Circuit theory is the systematic analysis of the properties of electric networks.

Suggested technical electives:

Systems, networks, control, communications and mathematics.

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 petrochemical 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 are 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.

Technical Electives

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:

Electronic Materials:

Electrical Engineering 130A, 140A, 140B, 145A, 145B, 145C, 148
Physics 121
Geology 180

Materials Design and Processing:

Engineering 104B, 104C, 106
Mechanical Engineering 121, 150, 151, 152, 155
Civil Engineering 136, 137

Automatic Control and Systems Analysis:

Mechanical Engineering 155, 171, 172
Electrical Engineering 118, 150, 157A, 157B

Physics of Solids:

Physics 115A, 115B, 140A, 140B
Electrical Engineering 145A, 145B, 145C, 148
Engineering 145
Geology 180

Environmental Engineering:

Engineering 160
Atmospheric Science 120, 122, 123
Biochemistry 101A, 101B
Water Science 120
Chemistry 8A, 8B
Civil Engineering 149

Chemical Corrosion:

Chemistry 110A, 110B, 110C or 107A, 107B
Chemical Engineering 151, 152A, 152B

Heat Transfer:

Engineering 105B
Mechanical Engineering 166
Chemical Engineering 150A, 153

Biomedical Engineering:

Chemistry 107A, 107B
Biological Sciences 1



"I like the end of the day, when you can see a student and a teacher side by side, continuing a discussion on their bikes as they leave campus."

Zoology 2
Physiology 110A, 110B, 111A, 111B
Electrical Engineering 161
Physical Education 104A, 104B

Computers:

Applied Science 115
Electrical Engineering 173, 174, 175, 176,
177
Mathematics 129A, 129B, 130A, 130B, 168

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 128A, 128B, 151, 152, 155,
162, 163, 165, 166, 172
Applied Science 115
Civil Engineering 131A, 132A
Agricultural Engineering 118, 119, 132
Engineering 104C, 111, 122, 140, 142, 160

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 161, 162, 163, 165, 166

Environmental Technological Systems: The objective of this area of specialization is to provide you with the background necessary for developing mathematical models of man's impact on the environment. Geophysical, living systems, and social environments are the subjects of study. It is expected that you will become a competent specialist in dynamic system analysis while gaining breadth in ecology and social system analysis. Examples of specific topics of study are: (1) generation, transport, and effects of pollution, (2) interspecies and intraspecies conflict and cooperation, (3) urban dynamics.

Suggested technical electives:

Mechanical Engineering 165, 166, 172
Engineering 115, 144, 145, 160
Civil Engineering 147, 149
Electrical Engineering 112A, 112B, 184A, 184B
Environmental Studies 100
Zoology 116, 155

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 134, 152, 165, 166, 172
Electrical Engineering 112A, 112B
Engineering 122, 140, 160

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 127, 128A, 128B, 134, 152,
161, 162, 172
Civil Engineering 131A, 149, 160

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 Department
- Applied Science Department (Davis-Livermore)
- Chemical Engineering Department
- Civil Engineering Department
- Electrical Engineering Department
- Mechanical Engineering Department

Professional programs emphasizing design and leading to the Master of Engineering and Doctor of Engineering degrees are offered by the following departments:

- Agricultural Engineering Department
- Civil Engineering Department
- Mechanical Engineering Department
- Electrical Engineering Department (Doctor of Engineering degree *only*)

Graduate students in engineering are permitted a 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 Office.

Off-Campus Learning

Many courses in engineering are available on the campus's television network at certain receiving sites in Livermore, Sacramento, Marysville-Yuba City, and the Diablo Valley. See the *Class Schedule* for quarterly off-campus course offerings.

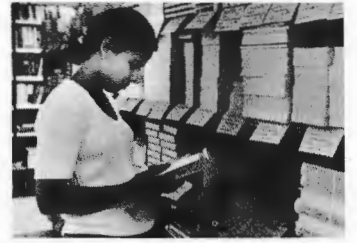
Graduate Certificate Program

For engineers who already have a degree, the College of Engineering offers a Graduate Certificate Program. This program consists only 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 and artistic accomplishments, and of matter and things. These three worlds are the domains of the social sciences, the humanities, 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 disciplines, 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 specialization in 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 requirements crucial to the realization of the College's educational goals: the English Composition Requirement, the Breadth Requirements, and the Major Requirement.

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 Requirement** enables you to gain intellectual depth and competence in a selected field of specialization.

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.

STUDENT SERVICES

Information:
Office of the Dean of the College
150 Mrak Hall
752-0392

The staff in this office can assist 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
- 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 98)

- 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 160 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 often 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.

Members of the Dean's Office staff are also available for consultation on any academic matter.

New students who participate in the Summer Advising and Registration Conference are assisted in planning their Fall Quarter program by a temporarily assigned summer adviser. During the fall or subsequent quarters, students wishing academic advice should request adviser assignment in the department administering the major they intend to pursue. Offices are listed in the *Class Schedule and Room Directory*.

Other entering lowerclassmen are assigned advisers following the Letters and Science Assembly, which is scheduled during the Orientation period at the beginning of each quarter.

Other entering upperclassmen report directly to the departmental office of their major during Orientation Week. (Biological Sciences majors report to the Division of Biological Sciences located in the Dean's Office.)

All new students are encouraged to contact an adviser. During the first three quarters of residence, students are expected to consult an adviser frequently and discuss proposed programs.

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 schedule errors which may delay graduation.

Undeclared students who are reasonably certain of their immediate educational goals should contact the department or program of their main interest and request assignment to an adviser. 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.

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. Those 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, or the Career Planning and Placement Center.

TEACHING CREDENTIAL

The teacher education program is administered by the Graduate Division. See page 107 for complete information.

THE MAJOR

There are three types of programs which satisfy requirements for the major: departmental majors, interdepartmental majors (formal majors built around courses from two or more departments in the College of Letters and Science), and individual majors.

Major Programs Offered by the College of Letters and Science¹

(These are also teaching departments or programs in the College of Letters and Science.)

American Studies
Anthropology²
Art History
Art Studio
Bacteriology²
Biochemistry³
Biological Sciences²
Black Studies
Botany²
Chemistry²
Comparative Literature

Dramatic Art
East Asian Studies
Economics
English
French
Genetics³
Geography
Geology²
German
Greek
History
Humanities
International Relations
Italian
Latin
Liberal Arts
Linguistics
Mass Communication
Mathematics²
Medieval Studies
Mexican-American (Chicano) Studies
Music
Philosophy
Physical Education
Physical Sciences²
Physics²
Physiology³
Political Science
Political Science: Public Service
Psychology²
Religious Studies
Rhetoric
Russian
Russian Literature and History
Sociology
Spanish
Zoology²

Declaration of Major

All new students, regardless of class level, are admitted to the College in Undeclared major status. Once registered, any student may, but is not required to, officially declare a major. A new transfer student with 88 or more units must do so by the end of the first quarter in residence. A continuing student must declare a major by the time 100 units have been completed.

If you fail to declare a major according to the above schedule, 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.

Procedures for declaration of major are the same as for change of major within the College (see page 91) and the same conditions for approval apply.

¹Astronomy, Classics, Education, Integrated Studies, and Oriental Languages are teaching departments or programs in the College of Letters and Science, but no undergraduate majors with these names are offered.

²Offers a program leading to the Bachelor of Science degree as well as a program leading to the Bachelor of Arts degree.

³Offers the Bachelor of Science degree only.

All other programs offer the Bachelor of Arts degree only.



"The competitive atmosphere is destroying the learning process. People compete for numbers (grades) rather than for ideas."

—Physics professor

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. The individual major permits you to pursue a specific academic interest which, for sound academic reasons, cannot be accommodated within the framework of an existing major program. Involving two or more departments, this major may consist of not fewer than 45 nor more than 54 upper-division units of which at least 30 must be from Letters and Science teaching departments or programs. No more than 10 upper-division units in courses 194H, 198, and 199 may be counted toward satisfaction of major requirements.

You prepare the final proposal for your individual major with the assistance of faculty advisers whom you choose. The principal adviser, however, must be a faculty member in a teaching department or program in the College of Letters and Science. You then submit the proposal, with faculty letters of recommendation, to the Dean's Office, where it is reviewed and forwarded to the Faculty Committee on Individual Majors for evaluation and final action. *You may not elect an individual major after the beginning of the fourth quarter before graduation.*

If you wish to undertake an individual major, request the appropriate forms, which include detailed instructions, from the Dean's Office, 150 Mrak Hall.

Multiple Majors

After endorsement 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. The double major is the most common type of multiple major.

Approval is subject to the following conditions:

1. In each major program, at least half of the upper-division units used to satisfy unit and course requirements must be unique to that program and may not be applied to the satisfaction of requirements in the other major, or majors, involved in the request.
2. It must be possible to complete all degree requirements within the 195-unit limit on registration (see page 98).

Approval of a multiple major neither implies nor guarantees approval to register beyond the 195-unit limit.

Requests for multiple majors must be based on sound academic and educational considerations. Frequently, when an individual major, a departmental major, or an interdepartmental major is supplemented with a carefully selected program 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.

Cross-College Major

You may pursue simultaneously 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 a B.S. degree in 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 new major is also required. Admission into a major program may be denied if your grade-point average in courses required for the proposed major is less than 2.000.

A *Petition for Declaration or Change of Major* must be filed. Petitions may be obtained from faculty advisers or the offices administering the respective major programs. Office locations are printed in the *Class Schedule*. 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. Advisers are assigned by the department or committee supervising the major program.

Except under unusual circumstances, no change of major will be permitted after you attain senior standing (135 units). Requests for exceptions will be checked to see if degree requirements can be met within the 195-unit limit (see page 98).

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. Moreover, your ability to complete all degree requirements close to the 195-unit limit is an important prerequisite for approval. Requests for changes of major from students in senior standing may be approved only under unusual circumstances. Students who have already completed 160 or more units will meet special problems, since the senior residence requirement demands completion of 35 units after transfer to the new college.

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 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 averages 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.

Departments and curriculum committees may refuse to accept a student into the majors they administer if he or she does not have at least a 2.000 average in the courses required for the major.

If 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, if your performance in the major is unsatisfactory (less than 2.000).



REQUIREMENTS FOR THE BACHELOR'S DEGREE

UNIVERSITY REQUIREMENTS

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

COLLEGE OF LETTERS AND SCIENCE REQUIREMENTS

College requirements for the bachelor's degree consist of:

- Unit Requirements
- English Composition Requirement
- Breadth Requirements (Foreign Language and Area Requirements)
- Residence Requirement
- Scholarship Requirement
- Major Program Requirement

Unit Requirements (A.B. and B.S.)

1. Total number of units180 unit minimum
(*Note 195-unit limit on registration, page 98.*)195 unit maximum
 - a. Total number of units in upper-division courses (100-199) 64 unit minimum
(*Included in the 180 units above*)
 - b. Total number of units in upper-division courses (100-199) offered by teaching departments and programs in Letters and Science (see list, page 89) 48 unit minimum
(*Included in the 64 upper division units in a above.*)
2. **The 180-195 units are subject to the following distribution requirements and restrictions:**
 - a. Courses transferred from community colleges (2-year institutions) 105 unit maximum
 - b. Units graded P (taken at student's option)1/4 of UCD units offered toward degree (maximum)
 - c. Physical Education 1 and similar activity courses6 unit maximum
 - d. 300 and 400 series courses9 unit maximum
(*See h and i below for additional restrictions.*)
 - e. Tutoring courses, such as those numbered 97T, 97TC, 197T, 197TC 10 unit maximum
 - f. University Extension courses9 unit maximum
(*Dean's approval required prior to enrollment. See page 95.*)
 - g. Special Study courses (99, 194H, 199) in any one quarter5 unit maximum
(*Exception: Units earned in Independent Studies Program. See page 131.*)
 - h. Graduate and professional Special Study courses, such as those numbered 299, 399, 499 ...no credit
(*See page 95.*)
 - i. Graduate and professional coursesvariable credit
(*Credit for graduate courses [200-298] post-graduate professional courses [400-498] offered by professional schools, and variable-unit courses in the 300 series [300-398] may be given by petition only. See page 88.*)

English Composition Requirement (A.B. and B.S.)

(Prerequisite: Subject A)

The requirement may be satisfied in two ways:

1. By passing an essay examination in English composition. This examination is taken after 70 units of degree credit have been accumulated, or as soon as possible thereafter. It may not be taken earlier.
2. By completing (with at least a C – or the equivalent) two of the following courses: English 1, 2, 3, 4A, 4B, 20, 45, 103. At least one of these courses must be taken after 84 units have been completed.

See page 95 for further details.

Breadth Requirements

1. Foreign Language Requirement

A.B.: 12-unit level12

(See page 96 for details.)

B.S.: None0

(Note requirements or recommendations in major programs.)

All language units may be counted toward the Social Sciences/Humanities Area Requirements.

2. Area Requirements

A.B.: Units in the Humanities, Social Sciences, and Natural Sciences/Mathematics52

(You must take a minimum of 12 units in each of the three areas. A maximum of 20 units may be counted toward any one area. See the list on page 94 for classification of courses.)

Upper-division units in Letters and Science teaching departments or programs in courses not offered by your major department or program12

(Included in 48 upper-division units required)

B.S.: Units in Natural Sciences/Mathematics90

Units in Social Sciences and/or Humanities20

(See the list on page 94 for classification of courses.)

Note: Applicability of courses to the Area Requirements:

a. Only those courses shown in the list on page 94 may be counted toward these requirements.

b. Number of units in Special Study courses (99, 194H, 199) counted toward Breadth Requirementsunit maximum 10

c. Courses numbered 48, 98, 198, 97T, 97TC, 197T, 197TC, and from 200 through 498, are not counted toward satisfaction of breadth requirementsno breadth credit

d. College Entrance Examination Board Advanced Placement Examination credit toward satisfaction of the Area Requirements is assigned according to the table on page 58.

e. Foreign Language courses.

A.B. Except for the first six units of course work in the language offered in satisfaction of the Foreign Language Requirement (course 1 or the equivalent in most languages offered on the Davis campus), all language courses may be counted toward completion of the Humanities Requirement.

B.S. All language courses may be counted toward satisfaction of the Social Sciences/Humanities Requirement.

Residence Requirement (A.B. and B.S.)

1. Upper-division unit requirements:

a. Upper-division units completed while registered in the College of Letters and Science ... minimum 27

b. Upper-division units in the major completed while registered in the College of Letters and Scienceminimum 18

2. See the University requirements, page 61.

Scholarship Requirement (A.B. and B.S.)

1. Grade-point average requirements in the major:

a. Grade-point average for all courses required in the major program2.000

b. Grade-point average for all upper-division courses required in the major program (see page 91.) 2.000

2. See the University requirement, page 61.

Major Program Requirements (A.B. and B.S.)

Requirements for major programs are described in the Majors and Courses section of this catalog, beginning on page 133.

You may fulfill major program requirements in one of two ways:

1. By completing a major program offered by a teaching department or curriculum committee in the College of Letters and Science (see page 89 for a list of majors offered in the College).

2. By completing an Individual Major program approved by the College's Committee on Individual Majors. (see page 90 for details.)

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 51

Area Requirement List

Subject to restrictions listed below, courses acceptable for breadth are classified as follows:

HUMANITIES

American Studies. *A.B.*: Equally divide a maximum of 16 units between humanities and social sciences. *B.S.*: 12 units allowed toward social sciences/humanities requirement.

Art.

Asian American Studies 1C-6C.

Black Studies 10.

Classics.

Comparative Literature.

Dramatic Art.

English. All courses except 25, 26, 28 and *first* freshman-level course (i.e., English 1, 2, 3, 4A, 4B, 5F, or 5P) completed. All subsequent courses in English counted toward humanities requirement.

Foreign Language (see page 96).

History.

Linguistics 105, 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

American Studies. (See "Humanities" above.)

Anthropology. All courses except 1, 5, 13, 150, 151, 152, 153, 154A, 154B, 155, 156, 195, 196.

Black Studies 100A, 100B, 101, 110A, 110B, 120A, 120B.

Chicano Studies 10.

Economics. All courses except 12.



Education. All courses except 114.

Geography. All courses except 1, 3, 105, 161.

Linguistics. All courses except 105, 106, 107, 196.

Native American Studies 20, 106, 110, 112, 116, 130A, 130B, 130C, 180.

Political Science.

Psychology. All courses except 15, 41, 103, 107, 108, 129, 131, 150, 165, 180A, 180B, 180D, 180K.

Sociology. All courses except 46A, 46B, 106.

NATURAL SCIENCES AND MATHEMATICS

Anthropology 1, 5, 150, 151, 152, 153, 154A, 154B, 155, 156.

Astronomy.

Bacteriology. All courses except 101.

Biochemistry and Biophysics.

Biological Sciences. All courses except 12.

Botany.

Chemistry.

Entomology 10, 100.

Genetics.

Geography 1, 3.

Geology.

Human Anatomy 101.

Mathematics.

Physical Education 103, 104A, 104B, 115.

Physics.

Physiology.

Psychology 15, 108, 129, 131, 150, 180B, 180D, 180K.

Zoology.

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 Breadth, 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
- 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

You must also meet certain minimal conditions before you can enroll in courses listed above. 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.

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.

Work-Learn

For information on work-learn internships, see page 22.

English Composition Requirement (A.B. and B.S.)

(The University Subject A requirement is prerequisite to fulfilling the College requirement.)

The requirement may be satisfied in two ways:

1. By passing an essay examination in English Composition. This examination should be taken once you have accumulated 70 units of degree credit, or as soon as possible thereafter. It may not be taken earlier.



Credit For Courses

Credit for Advanced Placement Examinations (see page 58).

Education Abroad Program

Full University credit may be awarded for courses taken through the Education Abroad Program. See pages 22 and 179 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

This academic year, the examination will be offered on the following Saturday mornings:

October 23, 1976

January 29, 1977

April 9, 1977

May 14, 1977

The May examination date is not open to seniors graduating in June or September. No examinations are given during the summer period. Sign-up rosters are posted on the Letters and Science bulletin board, opposite 175 Mrak Hall, Monday through Thursday of the week an examination is administered. Blue books are required. (Students in the College of Engineering may sign up in 2132 Bainer Hall.)

2. By completing (with at least a C- or P grade) two of the following courses: English 1, 2, 3, 4A, 4B, 20, 45, 103. At least one of these courses must be taken and passed *after 84 units have been completed*.

Transfer Courses in English Composition

Transfer courses considered by the Dean to be equivalent or comparable to English 1, 2, 3, 4A, 4B, 20, 45, or 103 will be accepted toward satisfaction of the requirement. If you wish to fulfill the composition requirement with two courses completed at another college, university, or campus of the University of California, you should file a request with the Dean's Office. Note that the second composition course must have been 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 accumulated 84 units, you may take such a course at Davis or fulfill the requirement by examination (see above).

Foreign Language Requirement (A.B. degree)

Acceptable Languages

The Foreign Language Requirement may be satisfied in any language offered at Davis, or for which transfer credit is allowed from another academic institution.

You may also satisfy the Foreign Language 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 exami-

nation 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. College Entrance Examination Board (CEEB) Achievement Test

Earn a qualifying score of at least 500 on a CEEB Foreign Language Achievement Test. This test may be taken at any time during your high school career. Once your score is on file at the Admissions Office, you should petition for satisfaction of the Foreign Language Requirement at the Letters and Science Dean's Office.

3. High School Work

If you graduated from high school and started college before June, 1975, and transfer to UC Davis no later than the Spring Quarter of 1977, you will have satisfied the foreign language requirement if one year of language study has been completed beyond the two-year level (third or later year) in tenth, eleventh, or twelfth grade with a B average or better. This option can be validated by petitioning the Dean.

No credit will be granted for course 1 in a language if you completed the first two years of high-school level work in that language.

4. College Entrance Examination Board (CEEB) Advanced Placement Examination

A score of 5, 4, or 3 on any foreign language Advanced Placement Examination taken in high school will satisfy the Foreign Language Requirement.

5. Course Completion in College (or the equivalent)

A.B.: 12-unit level in one language (e.g., Spanish 2 or Latin 3).

B.S.: as required in the major program.

6. 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 this examination. For more information consult the appropriate foreign language department.



HONORS

The Dean's Honors List

All students who complete at least 12 units of course work (exclusive of units graded Passed/Not Passed) with a grade-point average of 3.3 or better will have their names placed on the Dean's Honors List. This list is posted quarterly on the Letters and Science 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	
	Honors	Highest 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 should be submitted to the Dean's Office.

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.

MIDTERMS AND FINAL EXAMINATIONS

Midterms

Students should have the option of taking midterm examinations during regularly scheduled class periods, unless the fact that midterms will be given at other than scheduled hours has been publicized in the *Class Schedule* or in the class syllabus issued during the first class meetings.

Final Examinations

(General information on final examinations can be found on page 56.)

The regulations governing administration of final examinations in the College of Letters and Science are as follows:

1. Except under certain specified circumstances, Senate Regulation 772 requires that final examinations be given in all undergraduate courses.
2. At the instructor's option, a final examination in any undergraduate course in the College may be wholly or in part of the take-home type. In accordance with Senate Regulation 772(A), the writing time of a take-home and an in-class final examination together may not exceed three hours.
3. In all undergraduate courses of the College for which a final examination is required, any student shall have the right to take a final examination (or, when the instructor has so opted, to submit a take-home examination) at the time and on the date published in the *Class Schedule*.
4. Any change of examination time (including an early deadline for submission of a take-home examination) requires the mutual consent of the instructor and the students in the course. Any student who does not consent in writing to the change in time must be permitted to take the final examination (and/or to submit the take-home examination) at the officially scheduled time. A student who consents in writing to a change of examination time waives the right cited in (3) above.
5. A student who is improperly denied the right cited in (3) may file a petition with the College's Executive Committee by the end of the next regular quarter. Appropriate action will be taken.

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 must be filed in person. No signature other than yours is required on the petition. For detailed information, see page 54.

Graduating seniors, as well as any other student planning to undertake graduate or professional studies, should consult an adviser before enrolling Passed/Not Passed in courses required for the major program.

Limitation on Degree Credit for Units Graded Passed (P)

The number of units graded P that may be accepted in satisfaction of the unit requirements for an A.B. or B.S. degree in the College of Letters and Science is limited to not more than *one-fourth* of the units completed on the Davis campus and offered toward the degree. Courses described in this catalog as graded only Passed/Not Passed—including variable-unit courses—are *not included* in this limitation.

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 54).

REGISTRATION BEYOND THE 195-UNIT LIMIT

Once you have completed 195 units, you may register only with the permission of the Dean.

A minimum of 180 units is required for a bachelor's degree, and you are expected to complete all degree requirements within the range of 180 to 195 units.

Under unusual circumstances, permission to register after accumulation of 195 units may be granted, but for a limited time only. *Approval must be obtained before course enrollment materials can be made available for the quarter following completion of 195 units.* You are expected to adhere to the specific program of courses agreed upon and to meet other conditions that may have been set, e.g., minimal academic performance levels.

If you exceed 195 units before you complete four years of college study, you will usually receive permission to continue.

The desire to complete a multiple or cross-college major alone is not sufficient justification for enrollment beyond 195 units. Students who wish to change their major or who enter as transfer students in fairly advanced standing must realize there is no guarantee of continued registration once they reach 195 units.

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.

STUDY LIST REQUIREMENTS

Unit Limitations

Ordinarily, a full-time student is expected to take at least 12 units every quarter. (Note the Minimal Progress Requirements on page 57.)

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 Subject A, other non-credit remedial courses, and repeated courses. Make-up work to remove incomplete grades is not included in the 21 units.



"When I came to Orientation Week 4 years ago the Chancellor told us that all administrators on this campus have an "open door" policy—just come right in and we'll sit down and chat. Last Friday I went up to the top floor of Mrak Hall and I found out the Chancellor was right. Every single door was open . . . unfortunately no one was in."

—Senior, Rhetoric



The Graduate Division

Information:
Dean's Office
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 one of the 67 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 Development 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 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

Agricultural Chemistry (M.S., Ph.D.)
Agricultural Economics (M.S., Ph.D.)
Agricultural Education (M.Ed.)
Agronomy (M.S.)
Anatomy (M.S., Ph.D.)
Animal Science (M.S.)
Anthropology (M.A., Ph.D.)
Art (M.F.A.)
Atmospheric Sciences (M.S., Ph.D.)
Avian Sciences (M.S.)
Biochemistry (M.S., Ph.D.)
Biomedical Engineering (Ph.D.)
Biophysics (Ph.D.)

Graduate
Division

Botany (M.S., Ph.D.)
Chemistry (M.S., Ph.D.)
Child Development (M.S.)
Classics (M.A.)
Clinical Psychology (Ph.D.)
Comparative Pathology (M.S., Ph.D.)
Computing Science (M.S., Ph.D.)
Consumer Science (M.S.)
Dramatic Art (M.A., M.F.A., Ph.D.)
Ecology (M.S., Ph.D.)
Economics (M.A., Ph.D.)
Education (M.A.)
Endocrinology (M.A., Ph.D.)
Engineering (M. Engr., D. Engr., M.S., 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.)
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.)
Vegetable Crops (M.S.)
Veterinary Medicine (D.V.M.)—refer to School of Vet-
erinary 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 Chemistry

Walter G. Jennings, Ph.D.
0485 Chemistry Annex

Anatomy

Benjamin L. Hart, M.D., Ph.D.
1093 Haring Hall

Atmospheric Science

John J. Carroll III, Ph.D.
239 Hoagland Hall

Avian Sciences

Wilbur O. Wilson, Ph.D.
102 Asmundson Hall

Biochemistry

Lloyd L. Ingraham, Ph.D.
115 Briggs Hall

Biomedical Engineering

Richard F. Walters, Ph.D.
Medical Learning Resources, School of Medicine

Biophysics

Richard S. Criddle, Ph.D.
555 Hutchison Hall

Botany

Norma J. Lang, Ph.D.
217 Robbins Hall

Child Development

Louise M. Bachtold, Ed.D.
211 Walker Hall

Clinical Psychology

Margaret S. Steward, Ph.D.
Mental Health, School of Medicine

Comparative Pathology

Jerold H. Theis, D.V.M., Ph.D.
Medical Microbiology, School of Medicine

Computing Science

Herschel H. Loomis, Jr., Ph.D.
Electrical Engineering, Bainer Hall

Consumer Science

S. Haig Zeronian, Ph.D.
Division of Textiles and Clothing

Ecology

R. Merton Love, Ph.D.
255 Hunt Hall

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
3450 Chemistry Annex

Genetics

Robert W. Allard, Ph.D.
201B Hutchison Hall

Horticulture

Kay Ryugo, Ph.D.
3021 Wickson Hall

International Agricultural Development

Lynn D. Whittig, Ph.D.
Soils and Plant Nutrition
139 Hoagland Hall

Linguistics

Wayne Harsh, Ph.D.
111 Sproul Hall

Microbiology

JaRue S. Manning, Ph.D.
Department of Bacteriology
156 Hutchison Hall

Nutrition

James G. Morris, Ph.D.
160 Animal Science

Pharmacology and Toxicology

Theodore C. West, Ph.D.
Medical Learning Resources, School of Medicine

Physiology

Irving I. Geschwind, Ph.D.
220 Animal Science

Plant Protection and Pest Management

Albert A. Grigarick, Jr., Ph.D.
318 Briggs Hall

Plant Physiology

Ray C. Huffaker, Ph.D.
Plant Growth Laboratory

Preventive Veterinary Medicine

Walter W. Sadler, D.V.M., M.P.H.
2079 Haring Hall

Range Management

R. Merton Love, Ph.D.
255 Hunt Hall

Soil Science

Robert M. Carlson, Ph.D.
3061 Wickson 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 may be denied admission if his or her scholastic record or undergraduate program of study is judged inadequate as a foundation for advanced academic or professional study. 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, California 95616. APPLICATIONS FROM U.S. CITIZENS MUST BE ON FILE NO LATER THAN *JUNE 1* FOR THE FALL QUARTER, *OCTOBER 1* FOR THE WINTER QUARTER, AND *JANUARY 1* FOR THE 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 made payable to The Regents of the University of California. *This fee is not refunded under any circumstances.* 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, or you may not be allowed to register at all. A student whose registration is delayed must obtain a Permit to Attend Classes from the Office of the Registrar.

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 the Standard Teaching Credential in Education and to 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 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.

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 eight months 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 recommended for meeting this requirement. 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.

A number of other tests given by authorized examiners abroad are also acceptable. These include the Michigan Test (English Language Institute Test, University of Michigan), the interview reports supervised by the Institute of International Education overseas office, and the American University Language Center (AULC) Test.

On arrival, all 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.

Doctor's Degree

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.



PROGRAM OF STUDY

New students are assigned an adviser within their department or graduate group, who will plan a program of study with you. The program will depend to some degree on your undergraduate 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 campus.

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. In order to avoid a \$10 late fee, these forms should be filed with the home campus 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 of the year preceding the Fall Quarter to be attended. These applications are considered only once a year; therefore 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 36).

TEACHER CREDENTIAL PROGRAM

The teacher education program is administered by the Graduate Division. Recent legislation, however, makes this 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 while finishing the requirements for the clear credential awarded after additional study and experience. Specific requirements are available from the Department of Education.

Acceptance into the *multiple-subject teaching credential (elementary) program* does not require any specific major. If you are accepted to this program, you can meet the State requirements for a diversified major through one of the following alternatives:

- (1) Through the diversified major in American Studies;
- (2) By completing a regular University major and achieving a passing score on the National Teachers Examination (Common Section).

Single-subject teaching majors (secondary) for which Davis students can qualify are: art, life science, English (including drama and speech), foreign languages, government, history, mathematics, music, physical education, physical sciences, and social sciences. For information concerning University majors which satisfy these teaching majors and/or State-approved examinations available to prove competence in these teaching majors, consult the appropriate adviser in the Education Department.

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. Applications for the 1977-78 program should be made in 174 Kerr Hall for the Department of Education, and at the Graduate Division for the Department of Applied Behavioral Sciences (home economics and agricultural education). Information on filing deadlines should be obtained from these two departments.

Because the details of the Teacher Preparation and Licensing Law are complex, if you are considering teaching as a career, you should consult the Department of Education (174 Kerr Hall) as early as your freshman year for advice on preparing for a teaching career.





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, California 94720
- (D) University of California, Davis, California 95616
- (I) University of California, Irvine, California 92664
- (LA) University of California, Los Angeles, California 90024
- (R) University of California, Riverside, California 92502
- (SB) University of California, Santa Barbara, California 93106
- (SC) University of California, Santa Cruz, California 95060
- (SD) University of California, San Diego, La Jolla, California 92037
- (SF) University of California, San Francisco, California 94122

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)
- Curriculum 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 (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 teaching 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)
 - School Librarianship (B, LA)
 - 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)

Professional Schools

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.

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 or peer advisers in the Department of Economics, Room 380, Kerr Hall, 752-0741.

FORESTRY

Preparation for Study: Consult this catalog (pages 67, 78, 282) and the announcement of the Department of Forestry and Conservation, UC Berkeley.

Preforestry advisers: E. H. Stanford, Department of Agronomy and Range Science, Room 267 Hunt Hall, 752-1702 or 752-1703; Jack Major, Botany Department, Room 7, Robbins Annex, 752-0621 or 752-0617.

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 School Admission Council.

Advising: Students interested in legal careers should consult the Pre-Law Advising Office Room 216, South Hall. Information is available about career possibilities in law, law school admission procedures, and academic program planning (see also page 29). Pre-law advisers for counseling about general law admission requirements are Naomi Sakai, coordinator, Pre-Law Advising Office, 752-3009; C. E. Jacobs, Department of Political Science, Room 271, Voorhies Hall, 752-2637 or 752-0966; Victor P. Goldberg, Department of Economics, Room 380, Kerr Hall, 752-0741.

School of Law, UC Davis: Consult this catalog (page 115), the *Announcement of the School of Law*, or the Dean's Office, Room 1011, King Hall, 752-0243.

MEDICINE

Preparation for Study: Students interested in career opportunities in the health sciences should visit the Health Sciences Advising Office, Room 103, South Hall. Professional and peer staff are available to advise in the preparation for these careers and assist with application procedures for entry into professional schools and training programs (see also page 28).

School of Medicine, UC Davis: Consult this catalog, (page 121), the *Announcement of the School of Medicine*, or the Office of Student Affairs, School of Medicine, 752-3171.

ALLIED HEALTH SCIENCES

Preparatory course work only is offered at the Davis campus, so that professional training for all fields must be completed elsewhere. Degree work is offered at Davis for the fields of medical technology and dietetics, but students must apply elsewhere for the required postgraduate internships. Consult the Office of Allied Health Sciences, School of Medicine (phone 752-0230) or the Health Sciences Advising Office, South Hall (phone 752-2672) regarding curricula and schools for all allied health fields.

Suggested Curricula. As specific school requirements vary, students should contact either the schools directly, the Office of Allied Health Sciences, or the Health Sciences Advising Office for more detailed information. Elective units for all programs must include course work in the social sciences and humanities; a foreign language is recommended. 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 so that 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.

Dental Hygiene

A minimum of two years' preparation is required prior to transfer into a professional curriculum offering a baccalaureate degree. Professional training is also available in community colleges. Students should take the Dental Hygiene Aptitude Test in May or November, one year prior to projected date of admission. Some schools may require tests of manual dexterity.

Biological sciences (one year with laboratory).
Recommended: Zoology 2; Bacteriology 2, 3;
Human Anatomy 101; Physiology 2-2L or
101-101L.

Chemistry 1A, 1B, 8A, 8B. Required by UCSF:
Chemistry 1C; Physics 2A, 2B, 2C, 3A, 3B, 3C.

Psychology: two courses.

Rhetoric 1.

Suggested electives: Nutrition 10 or 101, Physical
Education 5, Zoology 100, Pharmacology 100,
101, Sociology 1.

Dentistry

Students complete three to four years of preprofessional course work prior to admission to the three- or four-year dental curriculum. Students must take the Dental Admission Test in April or October, one year prior to projected date of admission.

Biological sciences (one year with laboratory).

Recommended: Zoology 105 or 106 or Anatomy
100; Zoology 100-100L.

Chemistry 1A, 1B, 1C and 8 to 12 units of organic
chemistry.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

Psychology: two courses.

Suggested electives: Mathematics 13 or Agricultural
Science and Management 150; Mathematics 16;
Genetics 100 or 115; Biochemistry 101
or Physiological Sciences 101; sculpture
course.

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,
171).

Applied Behavioral Sciences (e.g., courses 151,
152, 153, 154, 155, 160A-160B, 162, 163, 164,
172).

Community Health 101 or 204.

Economics (introductory and accounting, courses
150, 151, 152).

Engineering 5A, 5B, 15.

Epidemiology and Preventive Medicine 103.

History (e.g., courses 171C, 174A-174B, 185B).

Mathematics 13 or Agricultural Science and Man-
agement 150; Mathematics 19.

Medical Learning Resources 155.

Political Science (e.g., courses 100, 101, 102, 156,
180, 182, 183, 187).

Rhetoric 1, 3.

Sociology (e.g., courses 154, 180).

Medical Laboratory Technology

Students need to complete a baccalaureate degree including the following course work in order to qualify for the required twelve-month medical technology internship in California.

Professional Schools

Biological sciences: 27 units, including instruction in hematology (Clinical Pathology 101), immunology (Veterinary Microbiology 126 or Medical Microbiology 107), and medical bacteriology (Veterinary Microbiology 127).

Chemistry: 24 units, including courses 1A, 1B, 1C, 5, 8A, 8B and Biochemistry 101A or Physiological Sciences 101A.

Physics 2A, 2B, 2C. Recommended: Physics 3A, 3B, 3C.

Suggested electives: Veterinary Microbiology 132, Agricultural Economics 112, Electrical Engineering 155A, Physiology 2-2L or 101-101L.

Nursing

Two years minimum preparation is required prior to transfer into two or three-year clinical nursing curriculum.

Chemistry 1A, 1B, 8A, 8B.

Human Anatomy 101.

Physiology 2-2L or 101-101L.

Bacteriology 2, 3.

Psychology 1, 10, or 16.

Sociology 1.

Nutrition 10 or 101.

Psychology 112 or Human Development 100A-100B.

Suggested electives: Physics 10 and 3A, Rhetoric 1 or 3, Anthropology 2, Physical Education 5, 171, Nutrition 102, Family Practice 404, Psychiatry 223, Pharmacology 100 or 101, Community Health 205, Physical Medicine and Rehabilitation 470, Behavioral Biology 451, 468.

Occupational Therapy

Basic professional training may be taken either at the undergraduate or graduate level. Students must transfer to another school. Applicants are expected to be proficient in some arts and crafts activities and preferably knowledgeable also in some industrial arts and recreational skills.

Human Anatomy 101.

Physiology 2-2L or 101-101L.

Psychology 1, 10, or 16; and course 168.

Sociology: one course.

Human Development 100A-100B or Psychology 112.

Suggested electives: Biological Sciences 1; Human Development 100C, 102, 130, 131, 141;

Chemistry 1A; Rhetoric 1 or 3; art and design courses; Physical Education 103, 105, 110, 115, 125; Physics 10; Anthropology 2; Physical Medicine and Rehabilitation 470; Behavioral Biology 451, 468; Family Practice 404.

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 in April or October, one year prior to projected date of admission.

Biological sciences (one year with laboratory).

Recommended: Bacteriology 2 or 102 and 3; Zoology 105 or 106 or Human Anatomy 101 or Anatomy 100; Physiology 2-2L or 101-101L.

Chemistry 1A, 1B, 8A, 8B. Required by a few schools: Chemistry 1C, 9 units of organic chemistry.

Mathematics 13, 16A-16B. Required by some schools: 16C. Agricultural Science and Management 150 may be substituted for Math 13.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

Psychology: two courses.

Suggested elective: Rhetoric 1.

Pharmacy

One to two years minimum preprofessional course work is required prior to transfer to a three- or four-year clinical pharmacy program. Students may be required to take the Pharmacy College Admission Test in May or November, one year prior to projected date of admission.

Biological sciences (one year with laboratory); may include one botany course. Recommended: Zoology 2; Bacteriology 2 or 102 and 3.

Chemistry 1A, 1B, 1C and 9 to 12 units of organic chemistry. UCSF requires Chemistry 5.

Economics: one introductory course. A few schools require Economics 1A-1B.

Mathematics 16A, 16B, 16C.

Physics 2A, 2B, 2C, 3A, 3B, 3C.

Psychology: one course.

Suggested electives: Rhetoric 1; sociology or cultural anthropology; Economics 11A-11B; Physiology 100A or Zoology 121A or Botany 130.

Physical Therapy

Basic professional training is available at both the undergraduate and graduate levels; students must transfer to another school.

- Biological Sciences 1.
- Chemistry: one year. Recommended: Chemistry 1A, 1B, 8A, 8B.
- Human Anatomy 101.
- Physics 2A, 3A. Many schools require also Physics 2B, 2C, 3B, 3C.
- Physiology 2-2L or 101-101L.
- Psychology: two courses; Psychology 168 recommended.
- Suggested electives: Human Development 100A-100B or Psychology 112 and Human Development 100C, 131, 141; Bacteriology 2 and 3; Mathematics 13; Sociology 1, 3; Rhetoric 1, 3; Zoology 2, 106, and 143; Anatomy 215; Physical Education 103, 104A, 105, 110, 115, 125; Chemistry 1C; Physical Medicine and Rehabilitation 470; Behavioral Biology 451, 468.

Physician Assisting

The majority of programs require that applicants have one or two years of experience in direct patient care, usually as a medical corpsman or practical nurse. Nurse practitioner programs offer an alternative.

Recreational Therapy

Students may elect to transfer for optional professional training, offered through both baccalaureate and master's degree programs. Elective courses may be selected from the following:

- Behavioral Biology 451, 468.
- Dramatic Art.
- Environmental Planning and Management (e.g., courses 116, 134).
- Human Anatomy 101.
- Human Development (e.g., courses 100A-100B-100C, 101, 102, 103, 130, 131, 132, 141).
- Music (e.g., course 300).
- Physical Education (e.g., courses 5, 45, 103, 105, 110, 115, 125, 140, 171; activity including dance).
- Physiology 2-2L or 101-101L.
- Psychiatry 222.
- Psychology (e.g., courses 108, 112, 129, 145, 168, 170).
- Rhetoric 1, 3.
- Zoology 106, 143.

Speech Therapy

Students must transfer to another school by the graduate level for professional training through a master's degree or special teaching credential program. Elective courses may be selected from the following:

- Anthropology (e.g., courses 109, 110, 111, 114; courses 109 and 110 are fundamental to speech therapy).
- Behavioral Biology 451, 468.
- Education (e.g., courses 110, 117A, 151, 163, 164).
- Foreign language.
- Human Anatomy 101.
- Human Development (e.g., courses 100A-100B-100C, 101, 102, 121, 130, 131, 140A, 141).
- Linguistics (e.g., courses 35, 138, 150).
- Physical Medicine and Rehabilitation 470.
- Physiology 2-2L or 101-101L.
- Psychology (e.g., courses 108, 112, 129, 132A-132B, 150, 168).
- Rhetoric 1, 3.
- Zoology 106, 143.

REFERENCE BOOKS

School catalogs and reference texts are available in the Reference Room of the Shields Library, the Health Sciences Library, the Office of Allied Health Sciences, 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.



"I liked having our dorm so close to the barn. It's the closest I've ever lived to a cow."



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 1976 will see the School enroll its eleventh 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. The curriculum includes not only instruction to develop proficient legal practitioners, but also courses that reflect the general interests of the Davis campus in the environment, natural resources, urban problems, and state government.

The School offers opportunities 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, 216 South Hall (see page 29).

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 Educational Testing Service, Princeton, N.J. 08540.

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). The Committee also seeks students of diverse backgrounds, taking into consideration 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 September.

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 five times a year: February, April, July, 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 postmarked at least 30 days before the date of the test to insure 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, Educational Testing Service, Princeton, N.J. 08540.

Admission Procedures

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. Admission forms and the School of Law bulletin may be requested from the Office of the Dean, School of Law, University of California, Davis 95616. *The completed application must be returned to the Office of the Dean, accompanied by a \$20 non-refundable application fee in the form of a check or money order made payable to The Regents of the University of California.*

The last date for filing completed application forms, together with all supporting documents, including LSAT scores, Law School Data Assembly Service (LSDAS) reports, and letters of recommendation, is *March 1* of the year in which admission is sought. Earlier filing is strongly recommended and will materially assist the School of Law Admissions Committee in its considerations. No application will be considered if received in the Office of the Dean after March 1 of the year in which admission is sought.

2. You should register with the LSDAS no later than December 15 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, Educational Testing Service, Box 944, Princeton, N.J. 08540, not to the School of Law.

3. With rare exceptions, *no action will be taken* on any application until college grades are submitted through the first semester or quarter of the applicant's senior year. You will be required to submit directly to the School of Law a final transcript showing the award of a bachelor's degree.

4. Two letters of recommendation from disinterested 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 recently studied while in college. These letters of recommendation should be sent directly to the School of Law and must be received by the Office of the Dean before the Law School Admissions Committee can seriously consider your application.

5. 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.

6. When accepted by the School of Law, you are simultaneously admitted to the Graduate Division 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 119), you must make separate application to the Graduate Division of the University 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 Law School Admissions Committee 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 *July 1* 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 of law.

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, Filipino, 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, 145 Ninth Street, San Francisco, Ca. 94103.





Semester System

Beginning in 1976, the School of Law will operate on a semester system rather than the quarter system used on the remainder of the Davis campus. In 1976, instruction for first-year students will begin August 29; instruction for second- and third-year students will begin September 7.

Academic Year 1976-77 Calendar

FALL SEMESTER

First-year Intro. Program Begins	Sun. 8/29/76
Labor Day Holiday	Mon. 9/6/76
Law School Instruction Begins	Tues. 9/7/76
Thanksgiving Holiday	Thurs. 11/25/76— Fri. 11/26/76
Law School Instruction Ends	Wed. 12/22/76
Christmas Recess	Thurs. 12/23/76—Sun. 1/2/77
Reading Period	Mon. 1/3/77— Fri. 1/7/77
Law School Examinations Begin	Sat. 1/8/77
Examination Period Ends	Tues. 1/18/77

SPRING SEMESTER

Spring Instruction Begins	Mon. 1/24/77
President's Day Holiday	Mon. 3/28/77
Last Day of Instruction Before Spring Break	Fri. 4/1/77
Spring Recess	Sat. 4/2/77—Sun. 4/10/77
Law School Instruction Resumes	Mon. 4/11/77
Law School Instruction Ends	Fri. 5/13/77
Reading Period	Sat. 5/14/77—Wed. 5/18/77
Law School Examinations Begin	Thurs. 5/19/77
Last Examination Day for Third-year Students	Thurs. 5/26/77
End of All Examinations	Sat. 5/28/77
Commencement	Sun. 5/29/77
Memorial Day Holiday	Mon. 5/30/77

PROFESSIONAL CURRICULUM AND DEGREE

The course of study in the professional curriculum requires six semesters for completion and ordinarily 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.

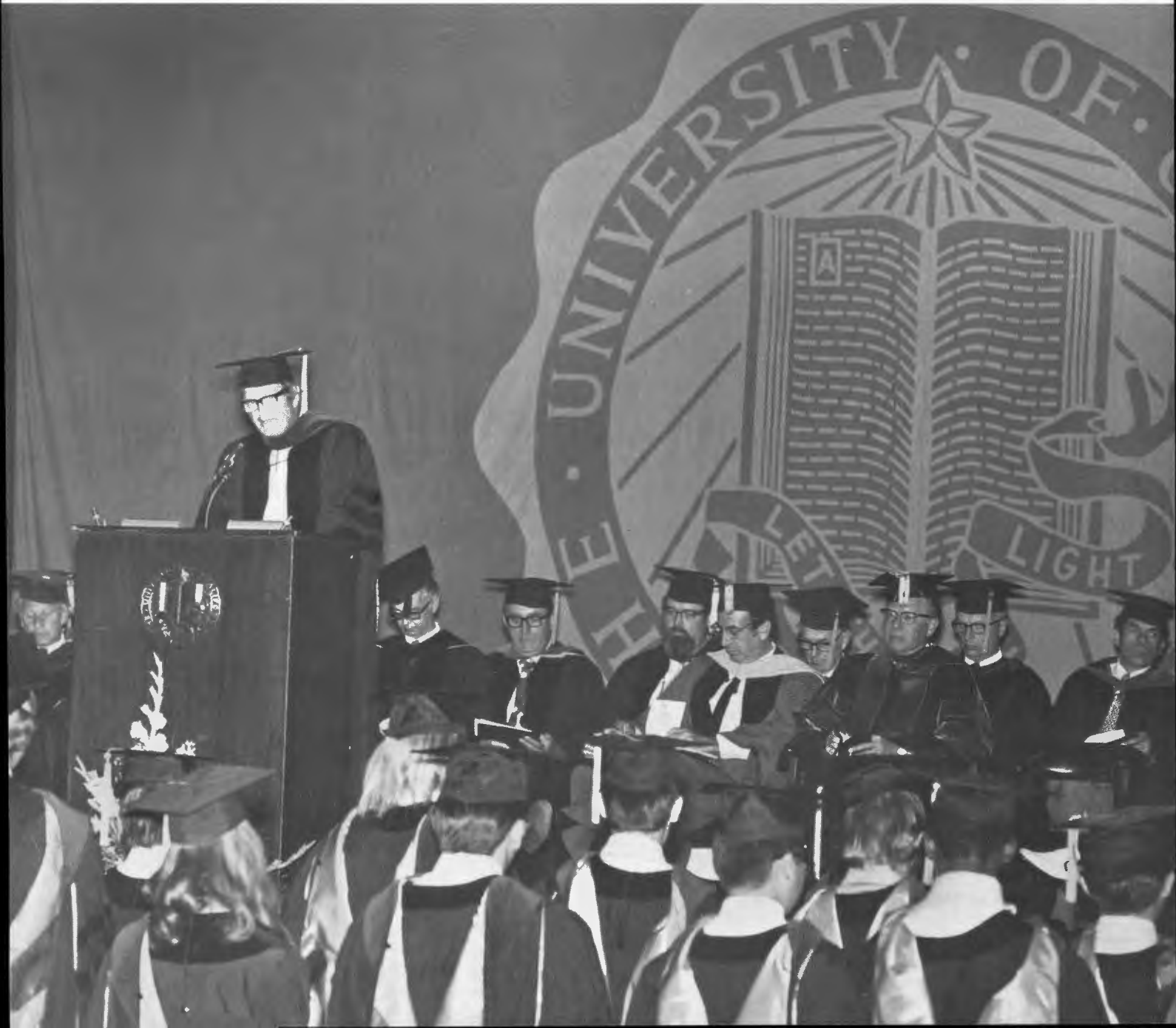
Normally, a Combined Degree Program will take at least 3½ to 4 years. You will usually be able to earn 8 semester-hours of law school credit for work in the related discipline and normally can complete the combined degrees in less time than it would take to earn the two degrees separately. The first year of the Combined Degree Program is usually 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.

APPLICATION MATERIALS

The *Announcement of the School of Law* and application materials may be obtained by writing to the Office of the Dean, 1011 King Hall, University of California, Davis, California 95616.



School of Medicine

Information:
Dean's Office
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 Sacramento Medical Center of the University of California, Davis, and in nearby affiliated hospitals.

The first permanent buildings for the School of Medicine are in various stages of completion. Built on a site adjacent to the Veterinary Medical Teaching Hospital on the Davis campus, the first phase—a series of single-story structures—is now completed and will be occupied this year. The second phase of the construction, a four-story building housing laboratory, classroom, and office facilities, is scheduled for completion by the middle of 1977.

ADMISSION POLICIES

The class entering in the fall of 1976 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 will 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, Col. 80302.

The School of Medicine is fully cognizant of the need for increased opportunities in medical education for individuals from disadvantaged educational and socioeconomic backgrounds. A special subcommittee of the Admissions Committee, comprised of faculty and assisted by students, has been appointed to identify and advise men and women from such backgrounds, to review applications from self-identified disadvantaged individuals, and to interview those whose applications indicate strong potential. The regular School of Medicine application procedures should be followed by disadvantaged applicants.

Transfer with Advanced Standing

A few openings may be available for students from other medical schools who wish to transfer into the third year of the curriculum. Students are not considered for transfer into the second or fourth years of the curriculum. If you wish to apply for transfer, write directly to the Secretary of the Admissions Committee for an application. Applications must be submitted by January 31. The third-year class commences its work early in July.

If you are applying from a foreign medical school, you are required to submit the results of Part I of the examination given by the National Board of Medical Examiners.

Application Procedures

The School of Medicine participates in the centralized American Medical College Application Service (AMCAS). Application Request Cards are available

School of Medicine

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 Card, 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 the AMCAS application has been received by the School of Medicine, the Admissions Office will notify you and may request letters of recommendation and a nonrefundable fee of \$20. These items should be sent directly to the Secretary of the Admissions Committee, School of Medicine, University of California, Davis, CA 95616, and not to the 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 two individual letters from faculty members familiar enough with you and your abilities to make a meaningful evaluation. It is suggested that one such letter be from a science instructor and the other from a non-science instructor. In addition, you may be requested to authorize your physician to furnish health information to the Admissions Committee.

Applications will be accepted by the Admissions Committee between July 1 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. Early processing is normally advantageous to an applicant.

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 the status of your application for admission as early as possible. The majority of accepted applicants will be notified December 15, January 15, February 15, or March 15.

Premedical Requirements

Arrangements for taking the 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



Secretary 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, Iowa 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:

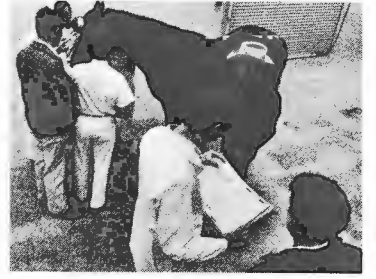
- a. English, 1 year or the equivalent
- b. Biological science, 1 year or the equivalent
- c. General chemistry, 1 year or the equivalent
- d. Organic chemistry, 1 year or the equivalent (If two or more undergraduate organic courses are offered, it is recommended that you elect the more rigorous option.)
- e. Physics, 1 year or the equivalent
- f. Mathematics, through integral calculus

Except in extraordinary circumstances, applications will be considered by the Admissions Committee only when an applicant's overall grade-point and science grade-point each average 2.5 or higher (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.

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.



School of Veterinary Medicine

Information:
Dean's Office
School of Veterinary Medicine
1018 Haring Hall
752-1360

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, this work must include at least 45 of the 58 quarter units of required science courses listed below. At least 28 units of Restricted Electives in social sciences, humanities, and agriculture are required.

You should plan your preveterinary medical education carefully. The required courses should be spaced over a three-year period 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. 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	17
English composition and additional English or rhetoric	8
Restricted Electives in social sciences, humanities, and agriculture (no more than 12 units in agriculture)	28
Total	94

Following is a list of courses taught on the UC Davis campus which fulfill the preceding subject requirements.

	Total Units
Biological Sciences 1	5
Biochemistry and Biophysics 101A	3
Chemistry 1A, 1B, 1C, 8A, 8B ... (5,5,5,3,3)	21
English 1 and additional English or rhetoric	8
Genetics 100A	3
Physics 2A, 2B, 2C	9
Physiology 101	5
Zoology 2; 100 including laboratory ..	12
Restricted Electives in social sciences, humanities, and agriculture (no more than 12 units in agriculture)	28
Total	94

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. Completed applications must be filed with the School by *November 1* in order to be considered for the beginning class in the fall of the following year. All required courses must be completed prior to the time you plan to begin the professional curriculum. Application forms may be obtained any time after August 15 from the Associate Dean—Student Services, School of Veterinary Medicine, University of California, Davis 95616.

Admission to the School of Veterinary Medicine

Evaluation is based on academic and nonacademic records. The academic record is divided into required science grade-point average, accumulative grade-point average, and the 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 nonacademic 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 8 to 10 applications from Californians for each of the 94 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 311. Specific questions should be addressed to the Attorney-in-Residence Matters, 590 University Hall, University of California, Berkeley 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, Colorado, 80302.

Men and women are considered on an equal basis. Socially and economically disadvantaged students are encouraged to apply. Applicants will be notified by April 15 regarding their admission status.

DEGREES

Requirements for the Bachelor of Science Degree

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 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 45 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, California 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

Explanatory Note

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 and changes to the General Catalog.

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 1976 would be an even-numbered year and Winter and Spring Quarters 1977 would be odd-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 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.

*Courses in the School of Law:
I. refers to Fall Semester (September - January)
II. refers to Spring Semester (January - May)

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:

- **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:

- **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 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 97T, 97TC, 98, 99, 194H, 197T, 197TC, 198, 199) must be approved by the chairperson of the department concerned based on 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 or 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. 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.

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 200, 300, and 400 series.



INDEPENDENT STUDY PROGRAM

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 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 Independent Study Committee either directly or through the dean's office.

Deadlines will be two weeks prior to the final enrollment date in the quarter preceding the proposed independent study quarter (see the Calendar on page 8).

You must report the completion or termination of the project to the Independent Study Committee, which may request additional materials if they were provided for in the project proposal.

For further information contact a member of the Independent Study Committee. You may obtain a membership list of the Committee through your college dean's office.

INDIVIDUAL MAJOR PROGRAMS

Opportunities for interdisciplinary programs tailored to your own educational objectives are offered by the "Individual Major" in the College of Agricultural and Environmental Sciences (page 67), the College of Engineering (page 73), and the College of Letters and Science (page 90).

WORK-LEARN PROGRAMS

Students may undertake a work-learn activity under courses in the College of Agricultural and Environmental Sciences (Work-Learn 192) and College of Engineering (Engineering 92 and 192). Other courses are found under departmental listings (see, for example, Education, Family Practice, Political Science, Psychology, and Rhetoric). Some 198 and 199 courses can be adapted to work-learn experiences by arrangement with a faculty member. For further information consult your adviser or the campus Work-Learn Center.

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 department in partial fulfillment of the residence requirement for the bachelor's degree. Enrollment is with the consent of the instructor only.

SUMMER SESSIONS

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 Sessions courses (see page 21).

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 47 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 1976-77
- ¹ Absent on leave, 1976-77
- ² Absent on leave, Fall Quarter 1976
- ³ Absent on leave, Winter Quarter 1977
- ⁴ Absent on leave, Spring Quarter 1977
- ⁵ In residence at President's Office (Berkeley campus)
- ⁶ In residence at Irvine campus

The course offerings listed in this catalog are subject to change without notice. For more current information, refer to the quarterly *Class Schedule and Room Directory* available in the UCD Bookstore.

Afro-American and Black Studies

(College of Letters and Science)

_____, Program Director
Program Office, 467 Kerr Hall

Committee in Charge

- ^{3,4} Albert J. McNeil, M.S. (*Music*);
Committee Chairperson (*fall quarter*)
_____; Committee Chairperson
(*winter and spring quarters*)
W. Jack Hicks, Ph.D. (*English*)
James R. King, Ph.D. (*Black Studies*)
Melvin R. Ramey, Ph.D. (*Civil Engineering*)
G. Thomas Saltee, Ph.D. (*Mathematics*)
Joe L. Singleton, M.A. (*Physical Education*)

Faculty

James R. King, Ph.D. Assistant Professor (*Black Studies*)

The Major Program

The Black Studies Program provides opportunity for interested students to pursue a thorough study of Black people. In addition to the Black Studies courses, the major includes course offerings from the departments of Anthropology, History, Political Science, and Sociology. Courses relevant to the major program are also offered in the departments of Applied Behavioral Sciences, Dramatic Art, Economics, Music, Rhetoric, and Psychology. The Program allows and encourages flexibility in order to cater to the interests of the individual student. Each student, however, is required to select an *area of emphasis* to satisfy the requirements for a major leading to a Bachelor of Arts degree in Black Studies. This area of interest should be discussed with and approved by the Black Studies Committee. Interested students should contact the Black Studies office.

Additional courses are being developed as part of a *new* proposed major in Afro-American Studies which will emphasize the tracing of Black culture through the transmigration of Black people from West Africa throughout the Western Hemisphere.

While the Black Studies program is interdisciplinary, the Afro-American Studies program will be disciplinary. For further clarification of differences between these two, students should consult the Director of these programs.

Black Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	38
One course from Anthropology 1, Biological Sciences 10, Genetics 10	4
Anthropology 2 or Geography 2	4
History 4B, 4C	8
Political Science 1 or 2D	4
Economics 1A or 1B	5

NOTE: For key to footnote symbols, see page 132.

Applied Behavioral Sciences 47	2
Music 28	4
Psychology 1	4
Plant Science 1	3

Depth Subject Matter

A coordinated program of upper division courses, selected and approved in consultation with the Committee, to include at least

Units in the student's area of emphasis	12
Additional upper division units	24

Recommended: Anthropology 102, 103A, 139A, 139B, 140, 141, 152, 153; Applied Behavioral Sciences 152, 172; Asian American Studies 110; Economics 125A, 125B, 150; History 102M, 115A, 175A, 175B, 176A, 176B; Political Science 101, 148A, 148B, 151, 152, 174, 178; Psychology 145, 147, 159; Sociology 118, 140, 143, 144.

Total Units for the Major 74

Major advisers. Contact the Black Studies Office (telephone 752-1549) for adviser assignment.

Teaching Credential Subject Representative. See page 107 for the Teacher Education Program.

COURSES IN AFRO-AMERICAN STUDIES

Professional Course

300. Afro-American Studies for Teachers (4) III. The Staff.
Lecture—4 hours. Prerequisite: consent of instructor. Methods of establishing, organizing, and teaching Afro-American and Black Studies. Designed for professional and preprofessional students who will be teaching black and/or ethnic studies in elementary and secondary schools.

COURSES IN BLACK STUDIES

Lower Division Courses

10. General Black Studies (4) I, II. King.
Lecture—4 hours. Survey of the field of Black Studies. For students who do not plan to major in Black Studies.

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. Ethnic Studies (3) 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.

100B. Ethnic Studies (3) III. The Staff
Lecture—3 hours. Prerequisite: course 100A or consent of instructor. Continuation of course 100A.

101A. Introduction to Black Studies (4) I. King
Seminar—4 hours. Prerequisite: Sociology 1 or Anthropology 2; History 27A-27B or 17A-17B; Psychology 1. Introductory survey of Black Studies methods and techniques; problems and methodology in Black Studies.

101B. Methodologies and Modes in Afro-American Studies (4) II. Geiger
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. Research Project in Black Studies (2) III. The Staff
Seminar—2 hours. Prerequisite course 101B. Review of research methods. Required for majors in Afro-American and Black Studies. Methods of reporting research into various aspects of Afro-American and Black Studies. Em-

phasis on project organization and research design. Opportunity to share research experientials.

105A. 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.

105B. From Africa to the Americas (4) II. The Staff
Lecture—4 hours. An exploration of the dimensions of slave trade in the Americas.

110A. West African Social Organization (4) I, King
Lecture—4 hours. Prerequisite: course 101A or consent of instructor. Ecology, population, social organization, and survival culture of West Africa in the pre-colonial, colonial, and post-colonial periods.

110B. West African Cultural Heritage (4) II. King
Lecture—4 hours. Prerequisite: course 110A or consent of instructor. Continuation of course 110A.

120A. Afro-America: Pre-Emancipation (4) II. King
Lecture—4 hours. Prerequisite: course 101 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.

120B. Afro-America: Post-Emancipation to World War II (4) III. King
Lecture—4 hours. Prerequisite: course 120A or consent of instructor. Continuation of course 120A.

197T. Tutoring in Black Studies (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of major committee; upper division standing with major in Black Studies. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. Course may be repeated for credit up to a total of 6 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Directed reading and discussion of selected problems in Afro-American (Black) Studies. (P/NP grading only.)

Agrarian Studies

(College of Agricultural and Environmental Sciences)

Faculty

Roger J. Romani, Ph.D., Professor (*Pomology*)

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.

Agricultural and Home Economics Education; Agricultural Chemistry

With appropriate selections of a field of emphasis and electives, you may also prepare for admission to graduate study or the professional schools.

Agrarian Studies

B.S. Major Requirements:

	UNITS	
Social Sciences and Humanities†	52	
Courses selected in consultation with an adviser and designed to develop an understanding of agriculture in the context of man and his cultural evolution. To include, but not limited to, courses in agricultural history, language‡ and the communicative arts, philosophy of science, anthropology and/or geography, political and/or economic principles.		
Natural Sciences†	52	
Courses selected in consultation with an adviser specifically to give the student an understanding of the scientific disciplines and biological systems important to modern, evolving agriculture. The program is to include, but is not limited to, courses in chemistry, biochemistry and/or physiology, mathematics (statistics and/or calculus), biological sciences (general biology and/or botany, genetics, microbiology or zoology), ecology, and the earth sciences.		
Agricultural Specialization†	36	
Agrarian studies (Agrarian Studies 2, 188).....	6	
Courses chosen to provide a depth of understanding in one of the following or closely allied fields: agricultural economics, animal sciences, food sciences, plant sciences, resource sciences.....		18
Closely related courses in either the natural sciences (e.g., nutrition, physiology, soils, etc.) or the social sciences (e.g., anthropology, geography, political science, etc.) chosen specifically to enhance the student's understanding of agriculture in a scientific or a cultural context.....		12
Unrestricted Electives	40	
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 College Office, 228 Mrak Hall.

Lower Division Course

2. Culture and Science in Agriculture (3) II. Romani
Lecture—3 hours. Introduction to agrarian studies, presenting relationships between agriculture and arts and sciences, natural and social, in evolution of man and his civilizations

Upper Division Course

188. Special Topics in Agrarian Studies (1) III. Romani
Discussion—1 hour. Prerequisite: course 2 or consent of

† Examples of typical programs in Agrarian Studies with suggested courses in these areas may be obtained from the major adviser

‡ 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.

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 Home Economics Education

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Applied Behavioral Sciences.

The Major Programs and Graduate Study. See majors in Home Economics (page 230) and Agricultural Education (page 137); and page 101 for graduate study.

Teaching Credential Subject Representative. Secondary Teaching Credentials—137 AOB IV (Agriculture); B.A. Adams, 139 AOB IV (Home Economics). Community College Credentials—137 AOB IV (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, 121 AOB IV.

Upper Division Courses

160. Vocational Education (3) III. Thompson
Lecture—3 hours. Philosophy and organization of vocational education, with particular reference to educational principles for agriculture commerce, home economics and industry.

161. Multi-Media Communication (2) III. Hagerty
Discussion—2 hours. Prerequisite: upper division or graduate standing and consent of instructor. Study of materials and procedures used in instructional presentations. Includes collecting, organizing, processing, and evaluating community resources.

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. Curriculum and Instruction: Home Economics (3) II. Adams
Lecture—3 hours. Prerequisite: Applied Behavioral Sciences 191A. Examination of basic concepts underlying the determination of objectives; selection and organization of learning experiences, materials and resources; and the evaluation process.

306A. Instruction in Secondary Schools: Agriculture (3) I, II.
Lecture—1 hour; discussion—1 hour; Laboratory—2 hours. Prerequisite: acceptance into the Teacher Education Program; course 306B (concurrently). Planning and organizing an effective curriculum. Selection, organization and evaluation of instructional materials. Use of audio-

visual aids and appropriate methods of teaching in the micro-teaching laboratory.

306B. Teaching in Secondary Schools: Agriculture (5-15) I, II.

Student teaching (corresponds with public school session) and related field work. Prerequisite: Applied Behavioral Sciences 191C or the equivalent; acceptance into the Teacher Education Program; course 306A (concurrently). Directed teaching including supervision of occupational experience programs and youth activities in secondary schools or community colleges.

307A. Instruction in Secondary Schools: Home Economics (3) I, II. Adams

Seminar—3 hours. Prerequisite: acceptance into Teacher Education Program; course 307B (concurrently). Techniques for developing, implementing and evaluating classroom teaching strategies and curriculum directions. (Deferred grading only, pending completion of sequence.)

307B. Teaching in Secondary Schools: Home Economics (5-15) I, II. Adams

Student teaching (corresponds with public school session) and related field work. Prerequisite: Applied Behavioral Sciences 191C or the equivalent; course 300; acceptance into the Teacher Education Program; course 307A (concurrently). Directed teaching in home economics programs in secondary schools. (Deferred grading only, pending completion of sequence.)

320A. Instructional Materials and Procedures (1) II, III. Hagerty

Discussion-laboratory—3 hours. Prerequisite: upper division or graduate standing and consent of instructor. Directed study of materials and procedures used in instructional presentations. Use of audio visual aids. (P/NP grading only.)

320B. Instructional Materials and Procedures (1) II, III. Hagerty

Discussion-laboratory—3 hours. Prerequisite: course 320A or consent of instructor. Directed study of materials and procedures used in presentations. Use of visual aids. Preparation of materials. (P/NP grading only.)

323. Resource Development: Agricultural Education (3) II.

Lecture—3 hours. Prerequisite: courses 306A, 306B. Selection and implementation of community resources in teaching.

Agricultural Chemistry (A Graduate Group)

(College of Agricultural and Environmental Sciences)

Walter G. Jennings, Ph.D., Chairperson of the Group
Group Office, 0475 Chemistry Annex

Faculty

Walter G. Jennings, Ph.D., Professor (*Food Science and Technology*)

Graduate Study. The Graduate Group in Agricultural 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 (Jennings 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 (Jennings 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 (Jennings in charge) Arrangements should be made well in advance with a member of the Group in Agricultural Chemistry. (S/U grading only.)

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

Daryl E. Carlson, Ph.D., Assistant Professor
Hoy F. Carman, Ph.D., Associate Professor
Harold O. Carter, Ph.D., Professor
James H. Cothorn, Ph.D., Lecturer
D. Barton DeLoach, Ph.D., Professor (*Emeritus*)
Jerry Foytik, 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., Assistant Professor
David E. Hansen, Ph.D., Associate Professor
Trimble R. Hedges, Ph.D., Professor (*Emeritus*)
George Hellyer, M.S., Lecturer
Gerald L. Horner, Ph.D., Lecturer
Richard E. Howitt, Ph.D., Assistant Professor
Edward V. Jesse, Ph.D., Lecturer
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., Assistant Professor
Sylvia Lane, Ph.D., Professor
Elmer W. Learn, Ph.D., Professor
Samuel H. Logan, Ph.D., Professor
Philip L. Martin, Ph.D., Assistant Professor
Alexander F. McCalla, Ph.D., Professor

Chester O. McCorkle, Jr., Ph.D., Professor
Charles McGahan, LL.B., J.D., Lecturer
Charles V. Moore, Ph.D., Lecturer
Quirino Paris, Ph.D., Associate Professor
A. Doyle Reed, Ph.D., Lecturer
Refugio I. Rochin, Ph.D., Assistant Professor
Lawrence E. Shepard, Ph.D., Assistant Professor
J. Herbert Snyder, Ph.D., Professor
Stephen H. Sosnick, Ph.D., Professor
James G. Youde, Ph.D., Lecturer
Barbara S. Zoloth, Ph.D., Assistant Professor

Major Program and Graduate Study. See the major in Agricultural Economics and Business Management (page 137); and see page 101 for graduate study.

Major Advisers. See *Class Schedule and Room Directory*.

Related courses. See Environmental Planning and Management 110; Environmental Studies 12, 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) II. 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 (½) I, II, III. Three one-day field trips; written report. Prerequisite: consent of instructor; open to non-majors. Field trips will be organized to observe aspects of the production, processing, handling, and distribution of agricultural products. Cooperatives and private businesses will be visited. Prior pre-enrollment with department required. (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. Economic Analysis in Agriculture (3) I, Kushman; II, Paris Lecture—3 hours. Prerequisite: Economics 1A, 1B; Mathematics 16A (may be taken concurrently). 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 completed Economics 100 or the equivalent may not receive credit for this course.

100B. Economic Analysis in Agriculture (3) II, Sosnick; III, Martin Lecture—3 hours. Prerequisite: course 100A. Pricing, output determination, and employment of resources under conditions of monopoly, oligopoly, and monopolistic competition. Students having completed Economics 100 or the equivalent may not receive credit for this course.

100C. Economic Analysis in Agriculture (3) III, Rochin Lecture—3 hours. Prerequisite: course 100B or the equivalent. Theory of regional specialization, location, and

trade for agricultural products; general economic equilibrium.

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 (3) I, Kushman; II, Zoloth Lecture—3 hours. Prerequisite: Mathematics 13 or the equivalent. Statistical methods for analyzing quantitative agricultural economics data: descriptive statistics, probability, hypothesis testing, statistical inference, and sampling.

106B. Quantitative Methods in Agricultural Economics (3) II, III, Foytik Lecture—3 hours; laboratory—1 hour. Prerequisite: course 106A or the equivalent. Statistical methods for analyzing quantitative agricultural economics data: linear and multiple correlation and regression analysis.

112. Fundamentals of Business Management (4) I, Logan; II, — Lecture—4 hours. Forms and organization of businesses; management principles and applications: planning, organizing, motivating, staffing, and controlling; corporate objectives, goals, and policies; long-range planning; introduction to financial statements; information systems for decision making. Some case studies, group discussions, guest lecturers.

113. Introduction to Marketing Management (4) II, — III, Youde Lecture—4 hours. Prerequisite: course 112 recommended. Background of modern marketing; concepts of markets; consumers and market demand; performance of the modern marketing system; products and product promotion; international markets and marketing effort; market planning and evaluation. Case studies, guest lecturers, gaming.

114. Production Management (4) III, Carman Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 recommended. 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.

117. Managerial Accounting (4) III, Moore 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, McCalla Lecture—3 hours. Analytical treatment of recent and current economic problems and governmental policies and programs affecting American agriculture.

125. Comparative Agriculture (4) II, 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 nonfarm sector, and development economics.

130. Agricultural Marketing (4) II, Carman; III, Sosnick 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.

140. Farm Management (5) III, Reed 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, Hellyer Lecture—3 hours; laboratory—3 hours; field trip. Principles of farm and ranch appraisal; land utilization in relation to

NOTE: For key to footnote symbols, see page 132.

Agricultural Economics

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. Prerequisite: students who have taken course 100A, Economics 100, or the equivalent must enroll in course 198, section 17 (Natural Resources) for 2 units of credit. 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.

148. Economic Planning for Regional and Resource Development (3) II, Howitt
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 markets; placement and supervision; off-season and in-season unemployment; organization and conflict; relevant legislation.

151. Economics of Poverty (3) III, Martin
Lecture—3 hours. Prerequisite: Economics 1A-1B or 2A-2B-2C 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) I, King
Lecture—3 hours. Prerequisite: Mathematics 13 and 16A. Introduction to selected topics in operations research, including mathematical programming, applied decision theory, game theory, and inventory models.

171. Investment and Capital Management (3) II, Carlson
Lecture—3 hours. Prerequisite: Economics 11A-11B. Financial analysis at the firm level; methods of depreciation; influence of tax structure; evaluation of investment alternatives; sources of capital; determining the cost of capital; leverage effects; capital rationing; working capital management; financial models under risk and uncertainty.

176. Economic Analysis in Resource Use (3) III, Green
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-190B. Senior Research Project (2-2) A: I, Martin; II, Snyder; III, _____; B: II, Martin; III, Snyder.
Lecture—1 hour; discussion—1 hour. Prerequisite: completion of courses 100A and 106A, or consent of instructor. Supervised individual research. The research report begun in 190A will be revised and completed in 190B. (Deferred grading only, pending completion of sequence.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

198. (Section 17). Natural Resources (2) I, Hansen
Lecture—3 hours; discussion—1 hour. Prerequisite: students who have taken course 100A, Economics 100, or the equivalent must enroll in this course instead of course 147. 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.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: junior or senior standing and consent of in-

structor. Limited to students with adequate preparation in Agricultural Economics. (P/NP grading only.)

Graduate Courses

200A. Microeconomic Theory (4) I, Paris
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A or consent of instructor. Theory of the firm under perfect competition; programming and dynamic models of the firm. (Same course as Economics 200A.)

200B. Microeconomic Theory (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A and Mathematics 16B or consent of instructor. Static and dynamic consumer behavior, imperfect competition, market and multi-market equilibrium, introduction to welfare economics and externalities. (Same course as Economics 200B.)

200C. Microeconomic Theory (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 103 and 200B. Linear economic systems, the static Leontief system, competitive general equilibrium, welfare economics, comparative statics and risk. (Same course as Economics 200C.)

221. Agricultural Policy in Developed Countries (3) I, 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.

222. Agricultural Policy and Planning in Developing Countries (3) III, McCalla
Lecture—3 hours. Agriculture in the structure of developing nations; its role in economic development; historical experience and theoretical models; agricultural and national planning; sectoral policies relating to prices, inputs, productivity, and marketing; international inputs into agricultural development; case studies.

240A. Econometric Methods (4) III, Green
Lecture—4 hours. Prerequisite: Mathematics 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.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A; Mathematics 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: Applications (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 (3) I, Foytik
Lecture—3 hours. Applied linear programming methods emphasizing uses for business decisions: production, diet, blending, network and related problems. Non-theoretical course designed for master's degree students.

253. Linear Programming Analysis of Operational Problems (3) I, _____
Lecture—3 hours. Linear programming methods with application to production, consumption, transportation, transshipment, and assignment problems; recursive and multiperiod programming, problems of aggregation and planning with limited information.

254. Quantitative Analysis of Operational Problems (3) II, Howitt
Lecture—3 hours. Nonlinear and dynamic programming methods with application to production, consumption, inventory, replacement market equilibrium, and competitive decision problems.

255. Systems Analysis and Simulation (3) III, Howitt
Lecture—3 hours. Dynamic model formulation and computer simulation of economic systems.

256. Applied Econometrics (3) II, King
Lecture—3 hours. 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, Kushman
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.

***260. Administrative Organization** (3) I.
Lecture—3 hours. Concepts and techniques of administrative and organizational behavior in the business firm; the role of personnel relations and leadership characteristics in achieving organizational goals and objectives.

261. Case Problems in Management (3) III, Carman
Lecture—1 hour; discussion—2 hours. Case problem analyses 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. Field Research Problem (3) (Extra Session—Summer) Carman
Field study—9 hours; research paper or case study. Students will function as an individual or as a member of a team solving an economic planning or operating problem of a firm or governmental agency. (S/U grading only.)

271. Financial Management (3) III, Sosnick
Lecture—3 hours. Prerequisite: course 171 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, Paris
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, French
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, Gardner
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, extramarket goods, indivisibilities, and intertemporal problems; benefit cost analysis and public and private investment criteria.

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) Field Research Essay. (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 Economics and Business Management

(College of Agricultural and Environmental Sciences)

The Major Program

Agricultural Economics and Business Management focuses on the student's understanding of the total economic 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) Agricultural Business Management.

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 Agricultural Business Management 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 Economics and Business Management

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	43
English (choose from English 1, 2, 3, 4A, 4B, 5F, or 5P)	4
English (from above list) or rhetoric (Rhetoric 1 or 3)	4
American History and Institutions	8
Economic principles (Economics 1A-1B)	10
Accounting (Economics 11A-11B)	7
Statistics (Mathematics 13)	4
Mathematics including calculus	6

†Students meeting the American History and Institutions requirement may substitute social sciences as interpreted under the Social Sciences Breadth Subject Matter requirement.

NOTE: For key to footnote symbols, see page 132.

Depth Subject Matter:	44-45
Theory: Agricultural Economics 100A, 100B	6
Statistics: choose two from Agricultural Economics 106A, 106B, and 155	6
Senior Research: Agricultural Economics 190A, 190B	4
Economics: any two upper division courses	6
One of two options:	
(a) <i>Agricultural Economics</i> (Professional)	23
Mathematics 16B	3
Agricultural Economics 100C	3
Economics 101	3
Additional upper division agricultural economics and economics	7
(b) <i>Agricultural Business Management</i>	22
Agricultural Economics 18	3
Restricted electives: choose 18 units from Agricultural Economics 100C, 112, 113, 114, 117, 130, 140, 145, 150, 171; Economics 134, 150, 160, 161	19

Breadth Subject Matter	32
Agriculture (excluding agricultural economics and consumer economics)	6
Natural sciences (including mathematics beyond preparatory subject matter)	6
Social sciences (excluding economics, history, and philosophy)	6
<i>Required: 8 units in one area and 12 units in each of the other two.</i>	

Unrestricted Electives	60-61
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. Foytik (*Agricultural Economics*).

Graduate Study. See page 101.

Agricultural Education

See 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

†Students graduating with this major are required to maintain at least a C average (2.0) in all Agricultural Economics courses taken at the University.

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 160	3
Agricultural engineering	11
Animal sciences	16
Applied Behavioral Sciences 191A-191B	2
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
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. O. E. Thompson (*Applied Behavioral Sciences*).

Teaching Credential Subject Representative.

Students may make appointments with credential counselors and obtain a statement of the complete requirements for the credential at the Applied Behavioral Sciences departmental office. Required courses for professional preparation include: Education 110, 120, 301; Agricultural and Home Economics Education 160, 320A, 320B, 323; and

§Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Agricultural Engineering; Agricultural Engineering Technology

9 postgraduate quarter units of courses selected from the areas of agriculture, applied behavioral sciences, community development, or ethnic studies. See also page 107 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 101. Further information may be obtained from the department and the *Announcement of the Graduate Division*.

Graduate Adviser. See *Class Schedule and Room Directory*.

Courses. See course listings under Agricultural and Home Economics Education (page 134) and Applied Behavioral Sciences (page 148).

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 169), and Engineering: Agricultural (page 186).

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 77-78); and see page 101 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 186. 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 (Fridley 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 (Fridley in charge)
(P/NP grading only.)

Upper Division Courses

101. Orchard and Vineyard Machinery (1) I, Studer
Lecture—1 hour; field trips. Prerequisite: upper division standing or consent of instructor. The relationship of orchard and vineyard 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. Kepner
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. 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 or consent of instructor. Principles, performance, and operating characteristics of machines for tillage, planting, cultivating, and harvesting field 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: upper division standing or consent of instructor. Procedures for supervision of operation, repair, and maintenance; systems analysis; machinery selection; effective use of human skills.

106. Vegetable and Small-Fruit Mechanization (1) III. Kepner

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Interrelationships of machines, harvest mechanization, and subsequent handling to the production, quality, and industry acceptability of vegetables and small fruits. (P/NP grading only.)

111. Microclimatology (3) I, Hatfield (Atmospheric Science)

Lecture—3 hours. Prerequisite: upper division standing, or Geography 1 or 3, or Atmospheric Science 20, or consent of instructor. Daytime radiation intensities, nocturnal heat losses, climatic elements over different ground cover and terrain. Modification of microclimate by sheltering, frost-protection devices, and windbreaks. Probabilities of temperatures, rainfall, and climatic hazards to agriculture (risk figures).

113. Animal Shelters, Environment and Related Equipment (1) III. Thompson

Lecture—2 hours (first five weeks of quarter). Prerequisite: Animal Science 2 or consent of instructor. Environmental considerations affecting the choice of animal shelter designs and materials; space, light, air, and temperature requirements; space arrangements; equipment.

114. Plant Shelters, Environment, and Related Equipment (1) III. Thompson

Lecture—2 hours (last 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 Processes (1) I, Singh

Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Topics selected on the basis of current student needs from principles of radiation, convection, and conduction. Emphasis on applications with examples drawn from food processing, heating, refrigeration, cooling, and drying.

121L. Heat Transfer Processes Laboratory (1) I, Singh
Laboratory—2 hours. Prerequisite: course 121 (concurrently). Directed laboratory exercises to augment the study of course 121.

131. Clean Air in the Rural Environment (1) II. Akesson
Lecture—1 hour. Prerequisite: upper division standing. Types, sources and strengths of rural air contaminants arising from food and feed processing, burning of wastes and use of agricultural chemicals. Effects of industrial, transport and agricultural contaminants on ornamentals, crops and forests; economics of improving air quality.

131L. Clean Air in the Rural Environment Laboratory (1) II. Akesson

Laboratory—3 hours. Prerequisite: course 131 (concurrently). Directed laboratory studies on instruments, measuring techniques and data analysis of air contaminants. Field trips and special projects to augment course 131.

132. Management of Agricultural Wastes (1) III. Horsfield

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. Horsfield

Agricultural Engineering

See Engineering: Agricultural; Agricultural Engineering Technology; Consumer Technology; and Agricultural Engineering

Agricultural Engineering

(College of Agricultural and Environmental Sciences)

Robert B. Fridley, 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*)
Paul A. Carroad, Ph.D., Assistant Professor
William J. Chancellor, Ph.D., Professor
Pictiaw (Paul) Chen, Ph.D., Lecturer
John B. Dobie, M.S., Lecturer
Robert B. Fridley, Ph.D., Professor
Roger E. Garrett, Ph.D., Professor
[†]John R. Goss, M.S., Professor
George F. Hanna, M.Ed., Lecturer
S. M. Henderson, M.S., Professor (*Emeritus*)
Brian C. Horsfield, Ph.D., Assistant Professor
Robert A. Kepner, B.S., Professor
Coby Lorenzen, Jr., M.S., Professor (*Emeritus*)
Allan A. McKillop, Ph.D., Professor
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
Herbert B. Schuitz, Ph.D., Professor (*Emeritus*)
R. Paul Singh, Ph.D., Assistant Professor
Henry E. Studer, M.S., Associate Professor

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 (1) III Akesson
Lecture—1 hour. 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. (P/NP grading only.)

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.)

198. Directed Group Study (1-5) I, II, III. The Staff (Fridley in charge)
Prerequisite: consent of instructor. (P/NP grading only)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Fridley 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 4A 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)

Faculty

George F. Hanna, M.Ed., Lecturer (*Agricultural Engineering*)

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
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
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.

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 and technology, 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	48
Biological sciences (including Biological Sciences 1 and Botany 2)	16
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Mathematics, including calculus and statistics	10
Physics (Physics 2A and 2B)	6
Depth Subject Matter	53
Agricultural sciences (including at least one course in animal science, food science, plant science, soil and/or water science)	20
Agricultural economics (including Agricultural Economics 100A and two courses from 112, 113, 114, 117, and 140)	15
Units in specialization (Animal Science, Food Science and Technology, or Plant Science)	18
Breadth Subject Matter	36
English and/or rhetoric (choose from English 1, 2, 3, 4A, 5F, 5P, Rhetoric 1, 3)	8
Economics (Economics 1A, 1B)	10
Social sciences and humanities electives	18
Restricted Electives to supplement or expand any of the above areas	19
Unrestricted Electives	24
Total Units for the Major	180

Major Adviser. F. D. Carroll (*Animal Science*).

Graduate Study. See page 101.

COURSES IN AGRICULTURAL SCIENCE AND MANAGEMENT

Questions pertaining to the following courses should be directed to the instructor or to the College Office, 228 Mrak Hall.

Upper Division Course

150. Applied Statistics in Agricultural Sciences (3) I, The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 13 and/or 16A recommended. Applications of statistical methods to analysis and interpretation of research data in agronomic, animal, behavioral, food, and nutritional sciences. Lectures cover concepts and basic statistical theory. Specialized laboratory sections cover procedures, data processing and interpretation.

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 101 for graduate study.

Related Courses. See Plant Science and Range Management.

COURSES IN AGRONOMY

Upper Division Courses

100. Science and Technology of Field Crop Production (3) I, III. Peterson
Lecture—3 hours; two Saturday morning field trips. Prerequisite: six units of plant science, botany and/or biology, or consent of instructor. Fundamentals of field crop production and solving agronomic problems using ecological, physiological, and genetic principles. Recommended for nonmajors in agronomy.

111. Cereal Crops of the World (4) II. Schaller
Lecture—3 hours; laboratory—3 hours (includes four field trips). Prerequisite: 6 units of plant science, botany, and/or biology, or consent of instructor. 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 Crops 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.

NOTE: For key to footnote symbols, see page 132.

Agronomy and Range Science; American Studies

*113. Fiber, Oil and Sugar Crops in a Changing World (4) I.

Lecture—3 hours; laboratory—3 hours (includes four field trips, one on Saturday.) Prerequisite: 6 units of plant science, botany and/or biology, or consent of instructor. 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.

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. Williams

Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing in Plant Science, Mathematics 13; an elementary knowledge of 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. Stanford

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.

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 Plant Communities (3) II. Laude

Lecture—3 hours. Prerequisite: Plant Science 101 or consent of instructor. Analysis and quantitative description of the structure and dynamics of field crop communities in relation to interplant competition, population functions, environmental stresses and adaptation.

232. Advanced Topics in the Physiology of Crop Plants (3) I. Huffaker

Lecture—3 hours. Prerequisite: Plant Science 102 or consent of instructor. Physiological aspects of vegetative and

reproductive growth of field crop plants in relation to their field behavior.

290. Seminar in Crop Growth, Production and Utilization (1-2) I, Valentine; II, Breidenbach

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.

298. Group Study (1-3) 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. (S/U grading only.)

Agronomy and Range Science

(College of Agricultural and Environmental Sciences)

Calvin O. Qualset, Ph.D., Chairperson of the Department

Department Office, 131 Hunt Hall (752-1703)

Faculty

Robert W. Allard, Ph.D., Professor (*Agronomy and Range Science, Genetics*)

R. William Breidenbach, Ph.D., Lecturer
John P. Conrad, Ph.D., Professor (*Emeritus*)

Beecher Crampton, M.S., Lecturer
Jan Dvorak, Ph.D., Assistant Professor

Ray C. Huffaker, Ph.D., Professor
Subodh K. Jain, Ph.D., Professor

M. B. Jones, Ph.D., Lecturer
Paulden F. Knowles, Ph.D., Professor

Ling-Jung Koong, Ph.D., Assistant Professor
(*Agronomy and Range Science, Animal Science*)

Horton M. Laude, Ph.D., Professor

William M. Longhurst, Ph.D., Lecturer
Robert S. Loomis, Ph.D., Professor

R. Merton Love, Ph.D., Professor (*Emeritus*)
Duane S. Mikkelsen, Ph.D., Professor

Maurice L. Peterson, Ph.D., Professor
Donald A. Phillips, Ph.D., Assistant Professor

Calvin O. Qualset, Ph.D., Professor
Charles A. Raguse, Ph.D., Associate Professor

D. W. Rains, Ph.D., Associate Professor
P. 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. Stanford, Ph.D., Professor

Robert L. Travis, Ph.D., Assistant Professor
Ray C. Valentine, Ph.D., Associate Professor

Barbara D. Webster, Ph.D., Lecturer
William A. Williams, Ph.D., Professor

Frederick P. Zscheile, Jr., Ph.D., Professor (*Emeritus*)

Courses. See course listings under Agronomy (page 139) and Range Management (page 286).

American Studies

(College of Letters and Science)

David S. Wilson, Ph.D., Program Chairperson
Program Office, 822A Sproul Hall

Committee in Charge

Bruce Hackett, Ph.D. (*Sociology*); Committee Chairperson

Vincent A. Crockenberg, Ph.D. (*Education*)
Dale Rogers Marshall, Ph.D. (*Political Science*)

David A. Robertson, Ph.D. (*English*)
Robert K. Sarlos, Ph.D. (*Dramatic Art*)

Robert Sommer, Ph.D. (*Psychology*)
David S. Wilson, Ph.D. (*American Studies*)

Faculty

Jay E. Mechling, Ph.D., Assistant Professor
Robert Merideth, Ph.D., Associate Professor

Merline A. Williams, M.A., Lecturer
David S. Wilson, Ph.D., Associate Professor

The Major Program

Students and faculty collaborate in classroom and field studies of American culture both as uniquely apprehended by individuals (artists, poets, ourselves) and as commonly objectivized in roles, institutions, material artifacts, language, etc.; with special attention to methodological issues and practices central to interdisciplinary study. Each student individually designs a program in consultation with an adviser, developing an "emphasis" and selecting courses which contribute vital information or useful tools and understandings to his or her project. Many construct programs which fulfill preprofessional requirements (law, medicine, journalism, library, education, social work, etc.) or prepare one for graduate work in American Studies.

American Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24
At least one course from American Studies 1A, 1B, 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 crosscultural 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, 140C, 190A, 190B, 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.

Major Advisers. J. E. Mechling, R. Merideth, M. A. Williams, D. S. Wilson (American Studies Program).

Teaching Credential Subject Representative. See page 107 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.).

1B. Magic and Religion in American Culture (4) II.

Wilson

Lecture—3 hours; discussion—1 hour; tutorial conferences, short projects, field exercises. Introduction to competing reality constructs, adept and popular wisdom, behavior, sacred communities, past and present; American faiths, "civil religion," secularism, occult and wisdom associations; classwork, directed independent projects, practice in learning from informants and documents (written, pictorial, musical, architectural, artifactual).

1D. Tradition and Revolution in American Culture (4) III.

Merideth

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; tutorial conferences, short projects, field exercises. Uses and abuses 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) 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 feminine 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.)

12. Schooling and Learning in America (2) I, II, III.

The Staff (Chairperson in charge)
Seminar—2 hours; participant observation—2 hours. A continuing proseminar on issues of schooling in America, with emphasis on connecting readings in theory and field experience in schools and other educational settings. May be repeated for credit up to a total of 12 units. (P/NP grading only.)

30. Fieldwork in American Civilization (4) III.

Mechling
Lecture—2 hours; fieldwork—2 hours; evaluation of written, visual, and aural field reports and conferences with individual students. A practical introduction to the multidisciplinary 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

100A-100B-100C. Issues in American Schooling (2-2-2) I-II-III.

The Staff (Chairperson in charge)
Seminar—2 hours. Prerequisite: course 12 or consent of instructor; enrollment in American Studies/Education teacher preparation program. Intensive proseminar study of selected topics in American Studies/Education dealing with the relation of theory to practice and of both to the values of social, political, and economic institutions.

101A-H. Special Topics (4) 1, 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. (P/NP grading 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.

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 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 up to 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.)

NOTE: For key to footnote symbols, see page 132.

Anatomy; Animal Genetics

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 (Human)

See Medicine

Anatomy

(School of Veterinary Medicine)

Leslie J. Faulkin, Jr., Ph.D., Chairperson of the Department

Department Office, 1072 Haring Hall

Faculty

George H. Cardinet III, D.V.M., Ph.D., Professor
Leslie J. Faulkin, Jr., Ph.D., Associate Professor
Benjamin L. Hart, D.V.M., Ph.D., 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., 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. Lectures, dissections, and demonstrations emphasizing the typical structure of the anatomical systems of the dog, chicken, and subhuman primate.

***170. Principles of Normal and Abnormal Animal Behavior** (3) III. Hart

Lecture—3 hours. Prerequisite: Veterinary Medicine 121 or Psychology 1 or the equivalent. Examination of normal behavioral patterns of domestic animals with emphasis on the historical, environmental, and organismic determinants of behavior. An analysis of factors contributing to abnormal behavior in domestic animals

198. Directed Group Study (2-5) 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) III. 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

202L. Organology (1) III. The Staff (Julian in charge)
Laboratory—3 hours. Prerequisite: course 202 (should be taken concurrently). Anatomical demonstrations of principles of organology

***203. Reproductive Biology of Laboratory Animals** (2) III

Lecture—2 hours; optional discussion—1 hour. Prerequisite: course in mammalian systemic physiology. Scientific basis for management of breeding colonies of mice, rats, rabbits, hamsters, guinea pigs, gerbils, cats, ferrets, macaques, squirrel monkeys, and didelphid marsupials. Anatomy, physiology, behavior, diseases, and environmental factors; solutions to practical problems and commonly used techniques. (S/U grading only)

205. Ultramicroscopic Anatomy (3) II. Tyler, Faulkin
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. Tyler
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. Tyler

Lecture—2 hours; discussion—1 hour. Consideration of the principles and applications of modern morphological methods and their role in biomedical research. Examples of specific methods include stereology, computer analysis of images, scanning and transmission electron microscopy, histochemistry, autoradiography, rapid freezing, and vascular injections. Offered in odd-numbered years.

210. Principles of Histochemistry (3) I, Tyler
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) III. The Staff
Lecture—3 hours; laboratory—9 hours. Prerequisite: Zoology 2. The microscopic anatomy of tissues and organs of mammalian and avian species of veterinary significance.

290. Seminar (1) I, Julian in charge
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 (2-5) I, II, III. The Staff (Chairperson in charge)
Laboratory—6-15 hours. Prerequisite: consent of instructor.

299. Research (2-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—6-36 hours. Prerequisite: consent of instructor. (S/U grading only.)

Anesthesiology

See Medicine

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 217).

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 College Office, 228 Mrak Hall.

Upper Division Courses

107. Animal Breeding and Genetics (4) I. Gall
Lecture—3 hours; discussion—1 hour. Prerequisite: Genetics 100B; Mathematics 13. Qualitative and quantitative inheritance in relation to animal breeding. Principles involved in utilization of selection and heterosis in livestock and poultry improvement.

108. Methods in Quantitative Animal Breeding (3) II. Rollins
Lecture—3 hours. Prerequisite: course 107. Methods and procedures in quantitative animal breeding; heritability, intra- and inter-population selection methods, including selection index, family, pedigree and progeny selection; genetic correlation; relationship and inbreeding.

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 material influence on different kinds of traits.

110. Animal Breeding Laboratory (2) II. Pollak
Lecture—1 hour; laboratory—2 hours. Prerequisite: course 107. Practice in application of principles of selection to livestock improvement, using computer generated herd records. Each student has a herd of animals in which

selection is practiced for several generations, and the effects on phenotypic and genetic trends are computed.

112. Seminar on Animal Breeding Experiments and Methods (1) III. Rollins

Seminar—1 hour. Prerequisite: course 107. Review and discussion of literature relating to breeding experiments and programs for livestock and companion animals.

198. Directed Group Study (1-5) I, II, III. The Staff (Bradford in charge)

Prerequisite: consent of instructor. Selected topics relating to animal genetics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Bradford in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

207. Quantitative Genetics and Animal Breeding (4) III.

Abplanalp (Avian Sciences)
Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 105B; Mathematics 16A recommended. The genetic theory of selection, population structure, and induced variation, and its implications in the design of animal breeding experiments.

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)

Verne E. Mendel, Ph.D., Chairperson of the Department

Department Office, 192 Briggs Hall (752-0203)

Faculty

- James M. Boda, Ph.D., Professor
- Ray E. Burger, Ph.D., Professor
- Harry W. Colvin, Jr., Ph.D., Professor
- Jack M. Goldberg, Ph.D., Assistant Professor
- John M. Horowitz, Jr., Ph.D., Associate Professor
- Barbara A. Horwitz, Ph.D., Associate Professor
- Frederick W. Lorenz, Ph.D., Professor (Emeritus)
- Verne E. Mendel, Ph.D., Professor (Animal Physiology, Animal Science)
- Edward A. Rhode, Ph.D., Professor
- Arnold J. Sillman, Ph.D., Assistant Professor
- Arthur H. Smith, Ph.D., Professor
- Irving H. Wagman, Ph.D., Professor

W. Jeffrey Weidner, Ph.D., Assistant Professor
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)

G. Eric Bradford, Ph.D., Chairperson of the Department

Department Office, 130 Animal Science (752-1250)

Faculty

- Gary B. Anderson, Ph.D., Assistant Professor
- †C. Robert Ashmore, Ph.D., Associate Professor
- R. L. Baldwin, Jr., Ph.D., Professor
- Donald L. Bath, Ph.D., Lecturer
- G. Eric Bradford, Ph.D., Professor
- Floyd D. Carroll, Ph.D., Professor
- Harold H. Cole, Ph.D., Professor (Emeritus)
- Perry T. Cupps, Ph.D., Professor
- J. Warren Evans, Ph.D., Associate Professor
- Graham A. E. Gall, Ph.D., Associate Professor
- William N. Garrett, Ph.D., Professor
- Irving I. Geschwind, Ph.D., Professor
- Paul W. Gregory, Sc.D., Professor (Emeritus)
- Hubert Heitman, Jr., Ph.D., Professor
- Carroll E. Howell, M.S., Professor (Emeritus)
- J. L. Hull, M.S., Lecturer
- Bonita Koller, M.S., Lecturer
- Ling-Jung Koong, Ph.D., Assistant Professor, (Animal Science, Agronomy and Range Science).

- †Robert C. Laben, Ph.D., Professor
- Oskar Lang, Dip., Vet. Med. Vienna, Lecturer
- Glen P. Lofgreen, Ph.D., 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
- E. John Pollak, Ph.D., Assistant Professor
- Edward O. Price, Ph.D., Associate Professor
- David W. Robinson, Ph.D., Professor
- Wade C. Rollins, Ph.D., Professor
- Magnar Ronning, Ph.D., Professor
- Nathan E. Smith, Ph.D., Assistant 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 man's domestic animal resources through the integration of genetics, biochemistry, physiology, nutrition, economics, and other social sciences for improvement and expansion of these resources for food and recreation. Emphasis may be placed on scientific, production, or management aspects and may focus on animals for milk, meat, fiber, work, or recreation. This major leads to a variety of career opportunities in management and produc-

Animal Physiology; Animal Science

tion including positions in feed and food processing, financial institutions, chemical industries, private and public extension services, education, and government service. *Preveterinary medicine* and other professional and graduate study requirements are also readily met.

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	45
General biological sciences (including Biological Sciences 1, Zoology 2, plus one course from Bacteriology 2, 3, Botany 2, or Entomology 100)	16
Physical sciences, 16 units of chemistry and 10 units of physics and/or mathematics	26
Animal science (Animal Science 2)	3
Depth Subject Matter	50
Biochemistry 101A-101B or Physiological Sciences 101A-101B)	6-7
Nutrition (Nutrition 110, or 103 plus one additional course)	5
Physiology (Physiology 101, 101L)	7
Genetics (Genetics 120, Animal Genetics 106)	7
Animal science:	25
Choose at least two courses from Animal Science 114, 115, 116, 117, 118A, 118B, 140, 141, 142.	
Choose the balance of units from courses in Animal Genetics, Animal Science, Nutrition, Physiology, and closely related areas, with adviser's approval.	
Breadth Subject Matter †	20
Social Science and humanities including at least 8 units of English and/or rhetoric	20
Unrestricted Electives	65
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. J. W. Evans.

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 101.

Graduate Adviser. G. A. E. Gall.

Related Courses. See Food Science and Technology 120.

COURSES IN ANIMAL SCIENCE

Lower Division Courses

1. Domestic Animals and Man (3) I, Smith
Lecture—2 hours; laboratory—2 hours. Animal domestication and factors affecting their characteristics and distribution. Animal use by man for food, work, fiber, drugs, research and recreation; projected effects of population expansion and urbanization. Demonstrations of beef and dairy cattle, poultry, sheep, swine and horses.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

NOTE: For key to footnote symbols, see page 132.

Anthropology

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. Carroll
Laboratory—6 hours. Prerequisite: course 1 or 2 recom-
mended. 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.

31A. Perspectives in Animal Science (1) I, Ronning
Lecture—1 hour; occasional discussion. Consideration of
the present-day scope of the broad field of animal science
and its role in modern society. Course of special interest to
students new to the campus. (P/NP grading only.)

31B. Current Topics in Animal Science (1) II. Ronning
Lecture—1 hour; occasional discussion. Lectures, as-
signed 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. Ronning
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 (Koller 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.)

99. Special Study for Undergraduates (1-5) I, II, III. The
Staff (Bradford in charge)
Prerequisite: consent of instructor. Problems in animal
biology: nutrition, breeding, and physiology of livestock.
(P/NP grading only.)

Upper Division Courses

111. Meats and Meat Animal Evaluation (2) I, Carroll
Laboratory—6 hours. Prerequisite: course 2 or 21. Corre-
lation 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, Smith
Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal
Genetics 107; course 124 and Nutrition 103 or 110, or
the equivalent recommended. 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: Gene-
tics 100B; Nutrition 103 or 110; Physiology 101. Feeding,
breeding, and management of horses; application of the
principles of basic animal sciences to problems of produc-
tion of all classes of horses.

116. Meat Animal Production (4) III. Garrett, Pollak
Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal
Genetics 107; Nutrition 103 or 110; Physiology 101.
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 from
Tropical and Arid Areas** (3) II. Morris
Lecture—2 hours; laboratory—3 hours. Prerequisite: a
course in nutrition; Physiology 101. 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 100B recommended. The ap-
plication of scientific knowledge to the improvement and
production of beef cattle and sheep. Reproduction includ-
ing artificial insemination; breeding plans; management;
supplementary feeding; marketing.

118B. Intensive Livestock Production (3) II. Carroll,
Heitman, Laben
Lecture—3 hours. Prerequisite: Nutrition 103 or 110. Re-
commended: courses 1, 2, and 118A; Genetics 100B.
Principles and practices involved in feedlot, dairy, and
swine operations. Growth and fattening; location; feeding
practices; methods of evaluating body composition of
meat animals; housing and equipment; waste disposal.

123. Animal Growth (4) II. Garrett, Ashmore, Pollak
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, post-
natal 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) I, Laben, Baldwin
Lecture—3 hours; laboratory—3 hours. Prerequisite:
Physiology 101 and Nutrition 110 or the equivalent back-
ground 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 perfor-
mance.

**127. Application of Mathematical Concepts to Animal
Science** (3) II. Koong
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 prob-
lems. Topics include mathematical modeling, systems
analysis and linear programming. Examples are drawn
from animal nutrition, physiology and management. (P/NP
grading only.)

***140. Management of Laboratory Animals** (4) I, The
Staff (Moberg in charge)
Lecture—3 hours; laboratory—3 hours. Prerequisite: Gene-
tics 100B; Nutrition 103 or 110; Physiology 101. Application
of the sciences of nutrition, physiology, and genetics to
maintenance of experimental animals. Management pro-
cedures will be examined in view of experimental needs,
government regulations, and animal health. Laboratory will
emphasize standard techniques used in laboratory animal
research.

141. Management of Nonhuman Primates (3) II. Moberg
Lecture—2 hours; laboratory—3 hours. Prerequisite:
course 140 and consent of instructor. Examination of cur-
rent husbandry practices used to maintain primates in
zoos, breeding colonies, and laboratories. The application
of concepts of physiology, nutrition and genetics to prob-
lems in reproduction, behavior, environmental stress, and
health will be discussed. Offered in even-numbered years.

***142. Husbandry of Semidomestic and Exotic Animals**
(3) II. Moberg
Lecture—2 hours; laboratory—3 hours. Prerequisite:
course 140 and consent of instructor. Course will review
the husbandry of semidomestic animals and the manage-
ment of exotic animals maintained in confinement. Prob-
lems unique to these animals will be discussed. Offered in
odd-numbered years.

190. Proseminar in Animal Science (1) I, Rollins
Seminar—1 hour. Prerequisite: senior standing in Animal
Science or consent of instructor. Reports and discussions
of recent advances in animal science.

197T. Tutoring in Animal Science (1-2) I, II, III. The Staff
(Bradford 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 (Brad-
ford 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 (Bradford 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

290. Seminar (1) I, II, III. The Staff (Bradford 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.)

298. Group Study (1-5) I, II, III. The Staff (Bradford in
charge)
Prerequisite: consent of instructor. Lectures and discus-
sions of advanced topics in the animal sciences.

299. Research (1-12) I, II, III. The Staff (Bradford in
charge)
(S/U grading only.)

Anthropology

(College of Letters and Science)

Delbert L. True, Ph.D., Chairperson of the
Department
Department Office, 328 Young Hall

Faculty

Martin A. Baumhoff, Ph.D., Professor
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*)
Suad Joseph, Ph.D., Assistant Professor
Henry McHenry, Ph.D., Associate Professor
Jerry A. Moles, Ph.D., Assistant Professor
David L. Olmsted, Ph.D., Professor
Benjamin S. Orlove, Ph.D., Assistant Professor
(*Environmental Studies*)
Peter S. Rodman, Ph.D., Assistant Professor
Lenora Timm, Ph.D., Assistant Professor
(*Linguistics*)
Delbert L. True, Ph.D., Professor
Carol F. Wall, Ph.D., Associate Professor

The Major Program

Anthropology is a broad and diverse field with
many subdisciplines, subdivided here at Davis
into four categories—physical, social/cultural, lin-
guistics, and archaeology. The goals for the An-
thropology major are to train students for graduate
study leading toward professional careers in an-
thropology 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 (prehistory 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 Mathematics 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
Mathematics 13	4
Zoology 2	6
Chemistry BA-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	8-9
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	91-103

Recommended

Geology 1, 1L, 3, 3L; Physics 2A, 2B, 2C; Psychology.

Bachelor of Science List of Courses

Physical anthropology: courses 150, 151, 152, 153, 154A, 154B, 155, 156.

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; Geology 106, 107; Human Anatomy 101; Physiology 110A, 110B, 110C, 111A, 111B; Psychology 108, 112, 150, 180; Zoology 100, 106, 107, 125, 136, 147, 148, 155.

NOTE: For key to footnote symbols, see page 132.

Major Advisers. R. T. Curley for the Bachelor of Arts degree; P. S. Rodman for the Bachelor of Science degree.

Teaching Credential Subject Representative. _____. See page 107 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. H. McHenry, C. F. Wall.

Related Courses. See Native American Studies 20.

COURSES IN ANTHROPOLOGY

Lower Division Courses

1. Physical Anthropology (4) I, Rodman; II, ____; III, McHenry
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, Crowley; 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 man's biology, his culture, and his society.

5. Proseminar in Biological Anthropology (4) II.
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 (True in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Principles of Human Ecology (4) II, Davis, Richerson (Environmental Studies)
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 social 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.
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) III, True
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1, 3, and 13. Theory and methods of prehistoric archaeology.

***103C. New World Prehistory: The First Arrivals (4) II, 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) III, True**
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) II, True
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) II.**
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, Moles**
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introductory survey of the Indians of South America; origins, languages, civilizations, and history.

***105C. Complex Societies of South America (4) III, Orlove**
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. 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.

***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) I, 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) III, 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

Anthropology

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) II. 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) II. Timm
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; course 4 or Linguistics 35. 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 Linguistics 114.)

116. Introduction to Ethnographic Research (4) III. Moles
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. Moles
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. Culture and Personality** (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Methods and theories in the study of the relationships among culture, society, and personality. The development of culture and personality as a subdiscipline in anthropology.

***119B. Culture and Personality** (4) III
Lecture—3 hours; discussion—1 hour. Prerequisite: course 119A. An examination of empirical investigations of preliterate and contemporary societies in relation to the techniques of culture and personality studies.

120. Language and Culture (4) III. Moles
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; course 4 or Linguistics 35. Language and thought; classification of languages; linguistic aspects of culture; language, nation, and state.

***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. The Anthropological Study of Religion (4) II. Curley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Major theories concerning religion in 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 within educational institutions in several different cultures.

128. Kinship and Social Organization (4) II. 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.

139A. Peoples of Africa (4) II. 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) III. 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) I, 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. Moles
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.)

***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 rising from the urbanization process and to relationships between national governments and rural populations

***147A. Peoples of the Pacific** (4) II.
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) III.
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.

***150. Primate Evolution Laboratory** (3) III. Rodman
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) III.
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) I, 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.

153. Human Variation (4) I.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. The origin and meaning of differences among human populations. Racial differences, such as those in blood groups, physiology, morphology, dermatoglyphics, will be considered relative to the evolutionary factors involved.

154A. Primate Behavior and Ecology (4) II. 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, Mathematics 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) II. McHenry
Lecture—2 hours; laboratory—4 hours. Prerequisite: Zoology 2. The functional anatomy of monkeys, apes, and man. Emphasis on the anatomical evidence for human evolution.

156. Human Osteology (4) I, 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.

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.

***192. 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.

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) II. 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.

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) II. Baumhoff

Seminar—3 hours. The history of thought in archaeology and analysis of research methods.

***209. Objectives and Methods for College Teaching of Anthropology** (2) I.

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, II, III. The Staff
Seminar—3 hours. Analysis of various phases of culture, such as religion, economics, law, and folklore.

216. Problems in Archaeological Method (4) I, Baumhoff

Seminar—3 hours. Techniques for analyzing archaeological data; application to various prehistoric cultures.

***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 Courses 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.

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) III. 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) I, 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.

***248. Concepts and Problems in Ecological Anthropology** (4) I.

Seminar—3 hours. Prerequisite: course 141 or the equivalent, or consent of instructor. Advanced study of theories, methods, and applications of the ecological perspective to cultural and physical attributes of human population.

250A. Theory and Method of Anthropology (4) II. Moles
Seminar—3 hours. Measurement, research design, field methods, data analysis, and theory construction in anthropological research.

***250B. Theory and Method of Anthropology** (4) II.

Seminar—3 hours. Prerequisite: course 250A. The application of symbolic analysis to anthropological materials.

250C. Theory and Method of Anthropology (4) I, Baumhoff

Seminar—3 hours. Prerequisite: course 250B. Continuation of course 250B.

253. Concepts and Problems in Physical Anthropology (4) II. McHenry

Seminar—3 hours.

254. Primate Behavior (4) II, Rodman; III, _____

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: course 165 or the equivalent, or 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.

***260. Ethnohistorical Theory and Method** (4) III. 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. Olmsted

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)

Orville E. Thompson, Ph.D., Chairperson of the Department

Department Office, 106 AOB IV (752-0770)

Faculty

Barbara A. Adams, M.P.H., Lecturer and Supervisor of Teacher Education
J. Howard Adams, Ph.D., Associate Professor
Louise M. Bachtold, Ed.D., Associate Professor
Keith Barton, Ph.D., Assistant Professor
Richard Berteaux, M.S., Assistant Professor
Edward J. Blakely, Ed.D., Associate Professor
Brenda K. Bryant, Ph.D., Assistant Professor
Glen Burch, Ed.D., Lecturer (*Emeritus*)
*Frances Butler, M.A., Associate Professor
Susan Crockenberg, Ph.D., Assistant Professor
*Jack D. Forbes, Ph.D., Professor (*Applied Behavioral Sciences, Anthropology*)

Isao Fujimoto, M.A., Lecturer
Dolph E. Gotelli, M.A., Assistant Professor
James Grieshop, Ph.D., Lecturer
Rebecka Hagerty, M.Ed., Lecturer
Lawrence V. Harper, Ph.D., Associate Professor
Glenn R. Hawkes, Ph.D., Professor
Alan B. Horowitz, Ph.D., Assistant Professor
Sarah H. Hutchison, M.Ed., Assistant Professor
Elwood M. Juergenson, Ph.D., Professor (*Emeritus*)

George Kagiwada, Ph.D., Assistant Professor
Peter C. Leung, M.S., Lecturer
George C. Longfish, M.F.A., Assistant Professor
*David B. Lynn, Ph.D., Professor

Applied Behavioral Sciences

E. Dean MacCannell, Ph.D., Assistant Professor
 Helge B. Olsen, Lecturer
 Debra Rapoport, M.A., Associate Professor
 Mary C. Regan, Ph.D., Associate Professor
 David Risling, M.A., Lecturer
 Katherine W. Rossbach, M.A., Professor
 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 and is available upon special application after admission to the College through an entry major such as Exploratory.*

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 Department Office.

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. E. D. MacCannell.

Graduate Study. See page 101 or the *Announcement of the Graduate Division.*

Related Courses. See Environmental Planning and Management 1, Environmental Studies 10, 101, 141.

COURSES IN APPLIED BEHAVIORAL SCIENCES

Lower Division Courses

17. Population Problems (2) II. Howard (Wildlife and Fisheries Biology)
 Lecture—2 hours. An assessment of relevant aspects of overpopulation to determine man's chance of survival.

***18. Scientific Myth and Social Bias** (3) III. Fujimoto, Regan
 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) I, II, III. The Staff
 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.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Thompson in charge)
 (P/NP grading only.)

Upper Division Courses

151. Community Research and Analysis (4) I, 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) I, The Staff (Thompson 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) II. 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. Blakely
 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) I.
 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 for Institutions** (4) II. Regan
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 160A and either Education 114, Mathematics 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, The Staff (Thompson in charge)
 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. The Staff (Thompson in charge)
 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 environment. 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. The Disadvantaged: Issues and Innovations (3) I, Wells
 Lecture—3 hours. Prerequisite: 10 units of psychology, sociology, and/or anthropology. Identification and characteristics of the "invisible" segments of society with emphasis on the socially and culturally disadvantaged. Barriers encountered by these individuals and avenues for change are explored.

173. The Continuing Learner (3) II. The Staff (Thompson in charge)
 Lecture—3 hours. Prerequisite: Education 110 (may be

taken concurrently) or consent of instructor. Principles of adult education emphasizing barriers to learning, the role of non-verbal communication, the importance of self-concept in teaching adults, and the educator's role in working with non-school populations.

190. Proseminar in Applied Behavioral Sciences (1) I, II, III. The Staff (Thompson in charge)
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.)

191A-191B. Introduction to Teaching (1-1) I-II. B. Adams
Lecture—1 hour; field observations in public schools. Observations of programs and classes in agriculture, home economics and related specialty areas in public schools, community colleges and public agencies. Observations begun in 191A will be continued in 191B. (Deferred grading only, pending completion of sequence.)

191C. Field Experience in Teaching (1-3) III. Adams
Discussion—1 hour; teacher assistant assignments in public schools. Prerequisite: course 191B. Field experience for students working as teacher assistants in agriculture or home economics programs in public schools. (P/NP grading only.)

196. Senior Project in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Thompson 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 (Thompson 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 (Thompson 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 (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.)

Graduate Courses

201. Planning Processes in Applied Behavioral Sciences (3) I. Thompson
Lecture—3 hours. Prerequisite: consent of instructor; course 201L (must be taken concurrently). Systematic approach to planning, including new concepts, theories, and methods for planning with application to educational institutions, agencies and the community at large.

201L. Laboratory in Planning Processes (1-3) I. Thompson
Seminar—1 hour; laboratory 3-9 hours. Prerequisite: course 201 (must be taken concurrently). Supervised practice in planning.

202. Systems for Change (3) II. B. Adams
Lecture—3 hours. Prerequisite: courses 201, 201L, and 202L (concurrently). Study of institutional processes, resource allocations, communication network, program priorities and destruct mechanisms needed for change.

202L. Laboratory in Systems for Change (1-3) II. B. Adams
Seminar—1 hour; laboratory—3-9 hours. Prerequisite: course 202 (must be taken concurrently). Supervised practice in an institution or agency studying the process of change.

203. Evaluation and Decision Making (3) III. Adams
Lecture—3 hours. Prerequisite: courses 202, 202L, and

203L (must be taken concurrently). 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 of change.

203L. Laboratory in Evaluation and Decision Making (1-3) III. Adams
Seminar—1 hour; laboratory—3-9 hours. Prerequisite: course 203 (must be taken concurrently). Supervised practice in evaluation and decision making.

290. Seminar (1) II, III. The Staff (Thompson in charge)
Seminar—1 hour. Analysis of research in applied behavioral sciences. (SU grading only.)

298. Group Study (1-5) I, II, III. The Staff (Thompson in charge)

299. Research (1-6) I, II, III. The Staff (Thompson in charge)
(S/U grading only.)

Art

(College of Letters and Science)

Richard D. Cramer, M.F.A., Chairperson of the Department

Department Office, 101 Art Building

Faculty

L. Price Amerson, Ph.D., Assistant Professor
Robert C. Arneson, M.F.A., Professor
Joseph A. Baird, Ph.D., Lecturer
Richard D. Cramer, M.F.A., Professor (*Acting Director, Laboratory for Research in the Fine Arts and Museology*)

Daniel J. Crowley, Ph.D., Professor (*Art, Anthropology*)

²Roy R. DeForest, M.A., Professor
Mary Fong, Ph.D., Assistant Professor
²Robert J. Grigg, Ph.D., Assistant Professor
William Henderson, M.F.A., Assistant Professor
Harvey Himelfarb, M.A., Associate Professor
Gerald R. Hoepfner, B.F.A., Lecturer
Seymour Howard, Ph.D., Professor
Cornelia S. Hudson, M.F.A. Assistant Professor
Ralph M. Johnson, M.A., Professor

⁴Lynn Matteson, Ph.D., Assistant Professor
Manuel J. Neri, Associate Professor
Roland C. Petersen, M.A., Associate Professor
Daniel Shapiro, Professor
Wayne Thiebaud, M.A., 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, printmakers, 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 under-

graduate and graduate. Some members of the department work in the Laboratory for the Fine Arts and Museology. Because of this association, 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 (Art 150-180); select 2 courses each from two separate periods (e.g., 154A, 154B and 178B, 178C)	16
Five additional courses from Group C	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 (Art 101-146)	24
One course from Group B, Theory and Criticism (Art 147-149)	4
Two courses from Group C, History of Art (Art 150-188)	8
Total Units for the Major	56

Recommended for 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*.

Art

Teaching Credential Subject Representative. Department Chairperson. See page 107 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, Matteson

Lecture—3 hours; discussion—1 hour. Major styles and masters of the Western world after the Counter Reformation.

1D. Oriental Art (4) I, Fong

Lecture—3 hours; discussion—1 hour. The art of India, South East Asia, China, and Japan.

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) I, 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, Thiebaut

Lecture—4 hours. The 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.

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

Group A: Practice of Art

101. Painting: Materials and Carriers (4) I, DeForest, Hoepfner

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

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 101 or consent of instructor. Advanced drawing; painting in various media including oil and polymers. May be repeated twice for credit.

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) II, Himelfarb

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 110 or consent of instructor. The art of the camera and light sensitive materials: tonal control, multiple exposure, synthetic negatives, etc. May be repeated twice for credit.

112. Ceramics I (4) I, III, Arneson

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) II, III, Arneson

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) II, Johnson

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) II, III, Shapiro, Petersen

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) III, Shapiro, Thiebaut

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) I, Shapiro, Himelfarb

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) II, Shapiro, Himelfarb

Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Traditional printmaking methods using photographically derived images: photolithography, photo-silkscreen, photo-etching, etc. May be repeated once for credit.

141. Sculpture: Non-Metal Materials (4) I, The Staff

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) II, 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 of the following 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, Thiebaut

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) I, 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) II, 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 Protogeometric 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) I, 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.

168. The Design and Development of Great Cities (4) I, III. 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 correlatives.

176A. Art of the Middle Ages: Early Christian and Byzantine Art (4) II. Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of the early Christian era and Byzantine Empire; through the later Roman Empire in the West and to the final capture of Constantinople in the East.

176B. Art of the Middle Ages: Early Medieval and Romanesque Art (4) III. Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of western Europe in the early medieval era: from the rise of the barbarian kingdoms through the twelfth century.

176C. Art of the Middle Ages: Gothic (4) 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.
Lecture—3 hours; term paper or gallery studies and review. Late medieval painting and sculpture. Origins of the Renaissance.

178B. Italian Renaissance Painting (4) II. Amerson
Lecture—3 hours; term paper or gallery studies and review. Painting in Italy in the fifteenth century.

178C. Italian Renaissance Painting (4) III. Amerson
Lecture—3 hours; term paper or gallery studies and review. Painting in Italy in the sixteenth century.

178D. Italian Renaissance Architecture (4) I.
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. Amerson
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) I.
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) II. Matteson
Lecture—3 hours; discussion—1 hour; 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. Matteson
Lecture—3 hours; discussion—1 hour; term paper or gallery studies and review. Later nineteenth century developments. Emphasis on France (Impressionism, Post-Impressionism, etc.).

183C. Painting in the Twentieth Century (4) III. Matteson
Lecture—3 hours; discussion—1 hour; term paper or gallery studies and review. Modern and contemporary developments. Emphasis on Europe and America (Cubism, Surrealism, etc.).

183D. Modern Sculpture (4) III. Howard
Lecture—3 hours; term paper or gallery studies and review. Sculpture from Neo-Classicism 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.

Group D: Special Study Courses

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.

254. Seminar in Ancient Art: Greece (4) II. Howard
Seminar—3 hours. Selected areas of special study in Greek art from Helladic 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.

276. Seminar in Medieval Art (4) I, 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. Amerson
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) II. Matteson
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) III Baird
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. Baird
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. Hoepfner
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. Hoepfner
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. Colateral 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 Studies)

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 148).

Related Courses

For other Asian languages, see Oriental Languages.

COURSES IN ASIAN AMERICAN STUDIES

Lower Division Courses

1C-2C-3C. Elementary Standard Cantonese (4-4-4)

I-II-III. Leung
Lecture—3 hours; laboratory—2 hours.

4C-5C-6C. Intermediate Standard Cantonese (3-3-3)

I-II-III. Leung
Lecture—3 hours; laboratory—1 hour. Prerequisite: course 3C or Oriental Language 3C. Continuation of course 1C-2C-3C.

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.

30. Race, Nationality, and the Asian American (4) I, Kagiwada

Lecture—3 hours; discussion—1 hour. Asian American experience, 1850 to the present with focus on Chinese, Japanese, and Pilipino.

31. Contemporary Asian Experience in America (4) III. Kagiwada

Lecture—2 hours; discussion—2 hours; Prerequisite: course 30 recommended. Analysis of ethnicity, race, and culture as it relates to the identity and growth of the Asian American.

Upper Division Courses

100. Asian American Communities (4) II. Kagiwada
Lecture—3 hours; discussion—1 hour. Prerequisite: course 30 or 31 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 30 or 31 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 30 or 31 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) III.

Lecture—4 hours. Prerequisite: course 30 or 31. 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.

121. Asian American Foods: A Cultural Phenomenon (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: course in cultural anthropology or Asian American studies recommended. Multi-disciplinary approach to Asian American cultural roots, i.e., food as symbol, as origin, in ritual celebration and as an acculturative mechanism.

***140. Speech Patterns of Asian Americans** (4) II.

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) I.

Lecture—3 hours; discussion—1 hour. Culture and history of the Philippines from pre-Hispanic to the present.

150B. Pilipino Experience (4) II.

Lecture—3 hours; discussion—1 hour. Pilipinos in America with emphasis on the changing structure of the community.

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.)

Astronomy

See Physics

Atmospheric Science

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Land, Air and Water Resources (Atmospheric Science Section).

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; condensation and precipitation mechanisms; 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 development in the private sector, and education. Examples of career areas are 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, 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	65
Mathematics (including Mathematics 21A, 21B, 21C, 22A, 22B, 22C)	21
Physics (Physics 4A, 4B, 4C, 4D)	16
Chemistry	10
Biology and botany (Biological Sciences 1, Botany 2)	10
English and/or rhetoric	8
Depth Subject Matter	30
Resource sciences	6
Atmospheric science (Atmospheric Science 110A, 110B, 110C, 120, 121A, 121B, 123, 124)	24
Breadth Subject Matter	28
Social sciences and humanities electives†	28
Restricted Electives	21
Resource and environmental sciences electives	7
Coordinated group of courses (minor area) to be chosen with adviser's approval from mathematics, environmental studies, resource management, or a physical or biological science	14
Unrestricted Electives	36
Total Units for the Major	180

Major Adviser. K. L. Coulson (*Land, Air and Water Resources*).

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

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. L. Coulson (*Land, Air and Water Resources*).

Related Courses. See Agricultural Engineering Technology 111; Engineering: Civil 149, 242; Environmental Toxicology 131; Geography 3; Water Science 202.

COURSES IN ATMOSPHERIC SCIENCE

Questions pertaining to the following courses should be directed to the instructor or to the College Office, 228 Mrak Hall.

Lower Division Courses

20. Introduction to Meteorology (3) I, Coulson
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, Coulson
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.

98. Directed Group Study (1-5) I, II, III. The Staff (Myrup 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 (Myrup in charge)
(P/NP grading only.)

Upper Division Courses

110A. Weather Analysis and Forecasting (3) II, Carroll
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 20 or the equivalent, course 121A (may be taken concurrently). Treatment of thermodynamic variables and processes as an integral part of atmospheric dynamics. Introductory cloud and precipitation physics. Analysis of weather systems, using vertical cross sections and thermodynamic diagrams.

110B. Weather Analysis and Forecasting (3) III, Wagner
Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 110A, 121A; knowledge of Fortran (Engineering 5A). Application of dynamic theory to weather systems. Numerical techniques and their application to numerical forecasting.

110C. Weather Analysis and Forecasting (3) I, Carroll
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 110B. Operational forecasting techniques including operational numerical forecasting, local detailed forecasts, tropical meteorology, and satellite applications.

120. Atmospheric Thermodynamics and Statics (3) I.
Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 4B, 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, Wagner
Lecture—3 hours. Prerequisite: course 120. The atmosphere in motion: the 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.

122. Atmospheric Radiation (3) II, Coulson
Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 4C. Basic laws of radiation; properties of solar radiation; absorption, reflection and scattering in the atmosphere; planetary albedo; absorption and emission by atmospheric gases and aerosols; atmospheric energy budget. Offered in odd-numbered years.

123. Micrometeorology (3) II, Myrup, Hatfield
Lecture—3 hours. Prerequisite: Mathematics 16B or the equivalent. Properties of the atmosphere near the earth's surface: frictional effects, mass and energy transfers across the surface—atmosphere interface, and the effect of these in modifying the localized environment.

124. Meteorological Instruments and Observations (3) II, Hatfield
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.

131. Air Pollution Meteorology (3) III, Coulson
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.

132. Cloud Physics (3) III.
Lecture—3 hours. Prerequisite: Chemistry 1B, Mathematics 22B, Physics 2C, or consent of instructor. The processes of cloud formation and precipitation; including water vapor condensation, cloud droplet growth, germination and growth of ice crystals, formation of rain, hail and snow. Radar detection of clouds and precipitation. Evaluation of weather modification practices.

133. Biometeorology (3) I, Hatfield
Lecture—3 hours. Prerequisite: course 123, Biological Sciences 1, one additional course in botany or zoology, or consent of instructor. The study of interactions of atmospheric and biological processes. Effects of vegetation on mass and energy transfers at the earth's surface; energy budgets of animals. Approaches to modeling atmosphere-biosphere interaction.

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.

198. Directed Group Study (1-5) I, II, III. The Staff (Myrup 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 (Myrup in charge)
Prerequisite: three upper division units in Atmospheric Science and at least an overall B average. (P/NP grading only.)

Graduate Courses

***221. Advanced Atmospheric Dynamics (3) III, Carroll**
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, Coulson**
Lecture—3 hours. Prerequisite: course 122 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 of the planet as a whole; methods of measurement. Offered in even-numbered years.

223. Advanced Micrometeorology (3) I, Myrup
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.

230. Atmospheric Turbulence (3) II, Dillon
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.

233. Topics in Advanced Biometeorology (3) III, Hatfield
Lecture—2 hours; discussion—1 hour. Prerequisite: course 133 or consent of instructor. The study of advanced topics in the biosphere-atmosphere interaction. Plant, animal and human energy budgets and the organisms' adaptation to changes in the energy budget. Human and other biological responses to the weather. Quantification of weather parameters for optimum biological responses.

240. Physical Climatology (3) III, Carroll
Lecture—3 hours. Prerequisite: course 123 or the equivalent. Physical causes of climatic phenomena, local energy balances and their direct and indirect effects on climate. Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. The Staff (Myrup in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Myrup 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)

Avian Sciences

Faculty

Ursula K. Abbott, Ph.D., Professor
 Hans (Johannas) Abplanalp, Ph.D., Professor
 Ray E. Burger, Ph.D., Professor
 Richard K. Enrikin, Ph.D., Lecturer
 C. Richard Grau, Ph.D., Professor
 F. Howard Kratzer, Ph.D., Professor
 Dorothy C. Lowry, M.A., Lecturer
 A. M. Morzenti, M.S., Lecturer
 Frank X. Ogasawara, Ph.D., Professor
 Leo C. Norris, Ph.D., Lecturer
 Daniel W. Peterson, Ph.D., Professor
 Pran N. Vohra, Ph.D., Professor
 Wesley W. Weathers, Ph.D., Assistant Professor
 Barry W. Wilson, Ph.D., Professor
 *Wilbor O. Wilson, Ph.D., Professor
 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, wildlife management, 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-learn 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
Mathematics (Mathematics 13)	4
Physics (Physics 2A and 2B or 2C)	6
Depth Subject Matter	51
Biochemistry (Biochemistry 101A, 101B)	6
Genetics (Genetics 100A, 100B)	6
Nutrition (Nutrition 110)	5
Physiology (Physiology 101, 101L)	6
Laboratory units in above listed subjects	4
Specialized courses related to avian species	24
Breadth Subject Matter	24
English and/or rhetoric: choose from English 1, 2, 3, 4A, 4B, 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 **27**

Unrestricted Electives‡ **37**

Total Units for the Major 180

Major Adviser. F. X. Ogasawara.

Graduate Study. Further training is available through graduate or professional programs in animal physiology, genetics, nutrition, or veterinary medicine. Detailed information on graduate study is available through the graduate adviser, or obtain the *Announcement of the Graduate Division*. See also page 101.

Graduate Adviser. C. R. Grau.

Related Courses. See Food Science and Technology 121.

COURSES IN AVIAN SCIENCES

Lower Division Courses

11. Applied Avian Biology (3) II. 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) II. 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
 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 odd-numbered years.

13. Birds, Man, and the Environment (2) III. Grau, B. W. Wilson
 Lecture—2 hours. 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. Morzenti
 Laboratory—3 hours. Demonstrations and field trips for students enrolled concurrently in course 13.

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.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

‡A student may take one quarter of work-learn experience for a maximum of 15 units.

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. The influences of genetic, environmental and behavioral factors on embryonic development; special emphasis on the effects of diet, drugs, and pesticides.

110. Comparative Avian Microanatomy (4) II. The Staff (Chairperson in charge)
 Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2 and Physiology 101. 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 Sciences 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. W. O. Wilson
 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. Woodard
 Seminar—1 hour. Prerequisite: senior standing in avian sciences or consent of instructor.

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.

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.

298. Group Study (1-5) I, II, III. The Staff (Woodard 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)

David Pratt, Ph.D., Acting, Ph.D., Chairperson of the Department
Department Office, 156 Hutchison Hall

Faculty

Paul Baumann, Ph.D., Associate Professor
Robert E. Hungate, Ph.D., Professor (*Emeritus*)
John L. Ingraham, Ph.D., Professor
Sydney G. Kustu, Ph.D., Assistant Professor
JaRue S. Manning, Ph.D., Associate Professor
Allen G. Marr, Ph.D., Professor
Herman J. Phaff, Ph.D., Professor (*Bacteriology, Food Science and Technology*)
David Pratt, Ph.D., Professor
Donald M. Reynolds, Ph.D., Associate 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 program and the Bachelor of Science program 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.

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	46-47
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Chemistry 1A, 1B, 1C, 5, 8A, 8B	25
Mathematics 16A, 16B	6
Physics	6
Recommended: Mathematics 13, Physics 2A, 2B, 2C	
Depth Subject Matter	36
Bacteriology 105, 106, 106L, or 130L, 130A, 130B	17-18
Biochemistry 101A, 101B, 101L	11
Genetics 100A-100B or 120	4-6
Additional units from the following courses to achieve a total of 36 upper division units: Bacteriology 107, 150; Biological Sciences	

162; Botany 114, 118, 119, Veterinary Microbiology 127, 128 1-4

Total Units for the Major 83

Bacteriology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	50-56
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Chemistry 1A, 1B, 1C, 5	19
Mathematics 13	4
Mathematics 16A-16B-16C; or 11 (or the high school equivalent) and 21A-21B-21C	9-14
Physics 2A-2B-2C	9
Recommended: a course in computer programming	
Depth Subject Matter	57-60
Bacteriology 105, 106, 107, 130A, 130B; 106L or 130L	20-21
Biochemistry 101A, 101B, 101L	11
Chemistry 107A, 107B, 128A, 128B, 128C, 129A	17
Genetics 100A or 120	3-4
Biological Sciences 162 or Veterinary Microbiology 128	3-4
Genetics 100B or Chemistry 108	3
Total Units for the Major	107-116

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 68	

College of Letters and Science students

Refer to page 92 for a description of requirements to be completed in addition to the major

Major Advisers. P. Baumann, J. S. Manning, W. P. Segel.

Honors and Honors Program. See major advisers above.

Teaching Credential Subject Representative. D. M. Reynolds. See page 107 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, 115 and 162; Food Science and Technology 106; Veterinary Microbiology 128.

COURSES IN BACTERIOLOGY

Lower Division Courses

2. General Bacteriology (3) I, II, 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 the student with the basic techniques of bacteriology, with the major responsibility for organizing and accomplishing the work resting with the student. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Pratt in charge)
Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

NOTE: The sequence of courses *Bacteriology 105, 106 and 107, is 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. The biology of bacteria and bacterial viruses. A survey course dealing with the physiology, genetics, and taxonomy of bacteria and their relation to man. Students who have had course 2 will receive only 2 units of credit.

105. Bacterial Diversity: Morphology, Systematics, Habitats (5) I, Wheelis, Segel
Lecture—2 hours; laboratory—6 hours; term projects and papers. Prerequisite: courses 2 and 3; Chemistry 8B (or 128A and 129A). The 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 prokaryote diversity with particular emphasis on aerobic and anaerobic energy-yielding metabolism, photosynthesis, 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.

***107. Bacterial Diversity: Ultrastructure and Morphogenesis** (3) III. Wheelis, Segel
Lecture and discussion—3 hours. Prerequisite: course 106 or consent of instructor. Comparative approach to the morphology, function, and chemistry of prokaryotic cell ultrastructure, emphasizing cell envelopes, locomotor and other organelles, morphogenesis and life cycles.

130A. Bacterial Physiology and Genetics (4) II. The Staff
Lecture—4 hours. Prerequisite: course 2 or 102; Biochemistry 101B (may be taken concurrently); Genetics

NOTE: For key to footnote symbols, see page 132.

Biochemistry

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. In-gram, Kustu
Lecture—3 hours. Prerequisite: course 130A. Regulation of synthesis of bacterial enzymes; the bacterial operon. DNA synthesis and cell division. Chemistry and function of bacterial walls and membranes. Ribosome function and synthesis. Mechanism of action of antibiotics.

130L. Bacterial Physiology Laboratory (3) III. Pratt
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 of control of enzyme synthesis by induction, repression and catabolic repression.

150. Eukaryote Protistology: Yeasts (3) II. Phaff
Lecture—3 hours. Prerequisite: Biological Sciences 1. 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 the morphology of cells and spores of selected yeasts and yeast-like fungi. Isolation and identification of selected yeasts from natural habitats. Nutritional experiments.

197T. Tutoring in Bacteriology (1-5) I, II, III. The Staff
Tutoring—1-5 hours. Prerequisite: courses 2 and 3; upper division standing and consent of instructor. Assistant 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 (Pratt in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Pratt in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A-200B-200C. Microbiology for First-Year Graduate Students (2-2-2) I-II-III. The Staff (Kustu in charge)
Discussion—2 hours. Prerequisite: first year graduate standing with interest in Bacteriology. A survey of general microbiology at the graduate level. The scope of the course will be determined by the content of the upper division series including courses 105, 106, 107, 130A, 130B, and Biological Sciences 162. (Deferred grading only pending completion of sequence.)

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 interactions. Principles and procedures of bacterial taxonomy.

***230. Bacterial Physiology** (2) III. In-gram, Marr
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
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.

***260. Bacterial Viruses** (2) III. Pratt
Lecture—2 hours. Prerequisite: consent of instructor. Selected topics on the structure, replication, and genetics of bacterial viruses. Offered in odd-numbered years.

270. Advanced Animal Virology (2) III. Manning
Lecture—2 hours. Prerequisite: consent of instructor. Selected advanced topics on the biological and biochemical properties of animal viruses. Offered in even-numbered years.

***280. Comparative Genetics of Prokaryotes** (3) II. Wheels
Lecture-discussion—3 hours. Prerequisite: knowledge of genetics of enteric bacteria recommended. Systems of genetic exchange and genetic mapping techniques in various groups of prokaryotes, with special emphasis upon the actinomycetes, pseudomonads, and bacilli. Offered in odd-numbered years.

291. Seminar in General Microbiology (1) I, II, III. Manning
Seminar—1 hour. A review and discussion of the current literature and developments in the field of microbiology with presentations by individual students. (S/U grading only.)

292. Seminar in Bacterial Physiology, Genetics and Virology (1) I, II. Kustu; III, Baumann
Seminar—1 hour. Prerequisite: consent of instructor. A review and discussion of the 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) I, II, III. Manning
Seminar—1 hour. Prerequisite: consent of instructor. A 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 (Pratt in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Pratt 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.

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.

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, 102-3, Botany 2, or Zoology 2	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., Mathematics 13 or 130A)	13-16
Physics (Physics 2A-2B-2C and 3A-3B-3C; or 4A-4C-4D†)	12 minimum
Depth Subject Matter	41
Biochemistry 101A-101B, 101L	11
Genetics 100A-100B	6
Organic chemistry: Chemistry 128A-128B-128C, 129A-129B-129C	15
Physical chemistry: Chemistry 110A-110B-110C or 107A-107B-108	9
Breadth Subject Matter	
<i>College of Agricultural and Environmental Sciences Students</i>	32
English 1 or the equivalent, plus four additional units in English or rhetoric	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 92 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.)	34-42
Total Units for the Major	180

Major Adviser. I. H. Segel (*Biochemistry and Biophysics*)

Graduate Study. See page 101, and under Biochemistry (A Graduate Group), page 157.

Courses. See under Biochemistry and Biophysics.

†Physics 4B and 4E are optional. Students electing the Physics 4 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 requirement.

Biochemistry (A Graduate Group)

(College of Agricultural and Environmental Sciences)

Michael E. Dahmus, Ph.D., Chairperson of the Group
Group Office, 149 Briggs Hall

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 (Dahmus in charge)
Seminar—1 hour. Prerequisite: consent of instructor. (SU grading only.)

299. Research (1-12) I, II, III. The Staff (Dahmus in charge)
(SU grading only.)

Biochemistry and Biophysics

(College of Agricultural and Environmental Sciences)

Roy H. Doi, 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., Associate Professor
Jerry L. Hedrick, Ph.D., Professor
Lloyd L. Ingraham, Ph.D., Professor
Mark G. McNamee, Ph.D., Assistant Professor
Jack Preiss, Ph.D., Professor
Irwin H. Segel, Ph.D., Professor
Paul K. Stumpf, Ph.D., Professor
Merna R. Villarejo, Ph.D., Assistant Professor

Major Programs and Graduate Study. See the major in Biochemistry (page 156); and for graduate study see page 101, 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
Lecture—3 hours. Prerequisite: Chemistry 8A or 128A. 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
Lecture—2 hours; laboratory—9 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 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 the 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 (1) III. Whitaker (Food Science and Technology)
Laboratory—3 hours. Prerequisite: course 101B; course 123 (concurrently). Laboratory procedures involved in the separation and study of enzymes.

133. Behavior and Analysis of Enzyme Systems (3) III. Segel
Lecture—2 hours; discussion—1 hour. Prerequisite: courses 101A and 101B. Introduction to enzyme kinetics and the varieties of enzyme behavior, with an 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
Lecture—2 hours; discussion—1 hour. Prerequisite: course 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 methods and as affected by physiological considerations.

153. Biosynthesis of Informational Macromolecules, Mechanisms and Regulation (3) II. Dahmus
Lecture—2½ hours; discussion—½ hour. 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 the 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.

197T. Tutoring in Biochemistry (1-5) I, II, III. The Staff (Doi 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-201B-201C. Advanced General Biochemistry (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 101B; Chemistry 107B-108 or 110C, 128C, 129C; or consent of instructor. Physical and chemical properties of amino acids, proteins, lipids, carbohydrates and nucleic acids; methods of isolating proteins; enzymes, including kinetics, cofactors, and type reactions; and the study of organized cell structures.

202A-202B. Advanced Biochemistry Laboratory (6-6) I-II. The Staff
Lecture—1 hour; laboratory—15 hours. Prerequisite: course 101A (may be taken concurrently); Chemistry 5. Laboratory methods and procedures used in biochemical research. Critical evaluation of experimental design and data is stressed.

203. Carbohydrates (3) III Preiss
Lecture—3 hours. Prerequisite: course 201C or consent of instructor. The chemistry, metabolism, and biological functions of the various classes of carbohydrates and their polymers. Biosynthesis of simple and complex sugars and polysaccharides. Offered in odd-numbered years.

***204. Nucleic Acids** (3) I, Bruening, Dahmus, Doi
Lecture—3 hours. Prerequisite: course 201C or consent of instructor. The physical and biological properties of nucleic acids; biosynthetic pathways; metabolism and structure of bases, nucleotides and their occurrence and distribution. The 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 of a study of the mechanisms of biochemical reactions.

***206. Physical Biochemistry of Macromolecules** (3) II. Criddle
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. A discussion of the chemistry, metabolism and experimental methodology unique to fatty acids, triglycerides, phospholipids, plasmalogens, sphingolipids, carotenoids and steroids. Offered in even-numbered years.

Biological Sciences

210. Protein Biochemistry (3) II. Geschwind (Animal Science)

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, emphasizing the use of chemical modifications as a tool in the study of active sites, particularly of enzymes, and relating the structure of proteins to their functions.

*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). The kinetic behavior of multivariable biological systems; mathematical methods and analysis of typical data with accent on computer use; in particular, the kinetics of multivariate 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; the organization and publication of science; basic versus applied research; axiology; antiscience. Offered in even-numbered years.

230. Biochemical Aspects of Endocrinology (3) III. Geschwind (Animal Science)

Lecture—3 hours. Prerequisite: course 101B; a course in endocrinology or consent of instructor. The chemistry and function of animal hormones, with special reference to the 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 the 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 the research activities of various members of the 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 the subject of their own research activities. (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)

James E. DeVay, Ph.D., Associate Dean, Division of Biological Sciences
Wiltraud P. Segel, Ph.D., Assistant Dean
Division Office, 150 Mrak Hall

The 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, will 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.

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	6
Chemistry 1A, 1B	10
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Mathematics	6
Recommended: Chemistry 1C; Physics 2A, 2B, 2C	
Depth Subject Matter	36
Genetics 100A, 100B	6
One course from Groups (a) through (e) (see "Course List for Group Requirement" below), and additional units to achieve a total of 36 upper division units in the biological sciences.	30

Upper division work must include at least one course in two of the following three areas of study: Animal Biology, Plant Biology, and Microbiology (see "Course List for Area Requirement" below). Both

halves of sequential courses connected by a hyphen must be taken.

Total Units for the Major 78-84

Biological Sciences

B.S. Major Requirements:

	UNITS
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 13 or 130A; 16A, 16B, 16C	13
Physics 2A, 2B, 2C	9
Zoology 2	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	6

One course from Groups (a) through (e) (see "Course List for Group Requirement" below), and additional units to achieve a total of 45 upper division units in the biological sciences 32-33

Upper division work must include at least one course in each of the following three areas of study: Animal Biology, Plant Biology, and Microbiology (see "Course List for Area Requirement" below). Both halves of sequential courses connected by a hyphen must be taken.

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 68	

College of Letters and Science Students

Refer to page 92 for a description of requirements to be completed in addition to the major

Course List for Area Requirement

(a) Organismal Biology: Bacteriology 105, 150; Biological Sciences 162; Botany 102, 105, 108, 114, 118, 119; Entomology 101, 103; Zoology 100, 105, 106, 112A, 112B, 133, 136, 137.

(b) Population Biology and Ecology: Anthropology 154A; Botany 117, 141; Entomology 104; Environmental Studies 100; Genetics 105; Geology 116, 150C; Water Science 120; Wildlife and Fisheries Biology 110, 151; Zoology 116, 125.

(c) Evolutionary Biology: Anthropology 151, 152; Botany 116, 140; Genetics 103; Geology 107; Plant Science 103; Zoology 148.

(d) Physiology: Bacteriology 130A-130B; Botany 111A-111B; Entomology 102; Physiology 101; Plant Pathology 130; Zoology 142, 143, 165. 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; Physiology 100A-100B, 103; Zoology 121A, 121B, 166.

Course List for Group Requirement

(a) Animal Biology: Anatomy 100; Anthropology 151, 152, 153, 154A, 155, 156; Avian Sciences

100; Entomology 101, 103, 104, 106, 109, 116, 119, 121, 123, 125, 127, 153; Geology 111A; Human Anatomy 101; Wildlife and Fisheries Biology 110, 120, 140, 151; Zoology 100, 105, 106, 110, 112A, 112B, 116, 125, 133, 136, 137, 147, 148, 149, 155.

(b) Microbiology: Bacteriology—all upper division courses except Bacteriology 101; Biological Sciences 162; Botany 114, 118, 119; Geology 111B; Medical Microbiology 107; Plant Pathology 120, 130; Veterinary Microbiology 126, 127, 128.

(c) Plant Biology: Botany 101, 102, 105, 108, 114, 116, 117, 118, 119, 121, 140, 141, 142, 190; Environmental Horticulture 105, 107; Plant Science 101, 103; Range Movement 100; Resource Sciences 110.

Note: Botany 114, 118, or 119 may be used for either microbiology or plant biology (not both).

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.

Major Advisers. Contact Division Office for adviser assignments.

Teaching Credential Subject Representative. W. P. Segel (*Bacteriology*). See page 107 for the Teacher Education Program.

COURSES IN BIOLOGICAL SCIENCES

Lower Division Courses

1. Principles of Biology (5) I, Murphy, Thornton (Botany); II, Pratt (Bacteriology); III, Shapiro, Wolfe (Zoology) Lecture-discussion—4 hours; laboratory—3 hours. Prerequisite: Chemistry 1B or a passing score on a qualifying examination in Chemistry. 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) II, Ketellapper (Botany); III, Greig (Zoology) Lecture—3 hours; discussion—1 hour. Not open for credit to those who have had course 1. 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.

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.)

98. Directed Group Study (1-5) I, II, III. The Staff Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

115. Problems in Marine Biology (15) III. DeVay, Associate Dean, Biological Sciences in charge Full-time study at Bodega Marine Laboratory. Prerequisite: consent of instructor based on adequate preparation for the topic under consideration, i.e., appropriate laboratory courses in invertebrate zoology (normally Zoology 112A or

112B), microbiology (normally Bacteriology 105), 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; contact Associate Dean. Limited enrollment.

162. General Virology (4) I, Manning (Bacteriology); Shalla (Plant Pathology); Bruening (Biochemistry) 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.

189. Integration of Biological Concepts (3) III. Lecture—2 hours; discussion—1 hour. Prerequisite: twenty upper division units in biology. A detailed examination in depth of the coherence of biology through a study of several unifying themes, for example, evolution.

197T. Tutoring in Biological Sciences (1-5) I, II, III. The Staff Prerequisite: upper division standing with major in a biological science. Assisting in courses under the direction of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Course

210. Effective Teaching of College Biology (2) III. Hildebrand (Zoology) Informal lecture-discussion—2 hours. The 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.)

Biomedical Engineering (A Graduate Group)

Richard F. Walters, Ph.D., Chairperson of the Group
Group Office, 204C, Surge IV

Faculty

P. James Stoll, Ph.D., Lecturer (*Human Physiology*)
Richard F. Walters, Ph.D., Associate Professor (*Medical Learning Resources, Human Physiology*)
Worden Waring, Ph.D., Professor (*Physical Medicine and Rehabilitation*)

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. W. Waring

COURSES IN BIOMEDICAL ENGINEERING

Graduate Courses

252. Advanced Information Systems (3) II. R. F. Walters Lecture—1 hour; seminar—2 hours. Prerequisite: Human

Biomedical Engineering; Botany

Physiology 151; consent of instructor. Case studies of Information systems; development of system components through projects; analysis of online file structures; strategies for systems performance optimization. (Same course as Human Physiology 252.)

290. Seminar (2) I, II, III. The Staff (P. J. Stoll 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)

Botany

(College of Letters and Science)

Ernest M. Gifford, Jr., Ph.D., Chairperson of the Department
Floyd M. Ashton, Ph.D., Vice-Chairperson of the Department
Norma J. Lang, Ph.D., Vice-Chairperson of Agricultural Botany
Department Office, 143 Robbins Hall

Faculty

¹Fredrick T. Addicott, Ph.D., Professor
Floyd M. Ashton, Ph.D., Professor
Daniel I. Axelrod, Ph.D., Professor
^{3,4}Michael G. Barbour, Ph.D., Professor
David E. Bayer, Ph.D., Lecturer
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
Emanuel Epstein, Ph.D., Professor (*Botany, Soils and Plant Nutrition*)
Richard H. Falk, Ph.D., Associate Professor
Ernest M. Gifford, Jr., Ph.D., Professor
^{3,4}Hendrik J. Ketellapper, Ph.D., Professor
Donald W. Kyhos, Ph.D., Professor
²Norma J. Lang, Ph.D., Professor
Jack Major, Ph.D., Professor
^{3,4}Terence M. Murphy, Ph.D., Associate Professor
Robert F. Norris, Ph.D., Associate Professor
Robert W. Pearcey, Ph.D., Assistant Professor
Steven R. Radosevich, Ph.D., Assistant Professor
Thomas L. Rost, Ph.D., Assistant Professor
C. Ralph Stocking, Ph.D., Professor
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

The Bachelor of Arts and Bachelor of Science programs are designed to introduce students to the disciplines dealing with the physiology, cytology, ecology, taxonomy, and morphology of seed plants and to provide an awareness of the diversities of other plant and plant-like groups. Students who plan advanced study in botany, or a related applied discipline, and who wish to obtain a general secondary teaching credential or training for a position requiring a detailed knowledge of plants should elect the Bachelor of Science major pro-

Botany

gram. Students who wish a less intensive program in botany, but one that acquaints a student with plant life and its importance, should elect the Bachelor of Arts major program.

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	32-37
Biological Sciences 1	5
Botany 2	5
Zoology 2	6
Chemistry 1A, 1B	10
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Depth Subject Matter	37
Botany 105, 108, 111A, 111B, 116	21
Genetics 100A, 100B	6
Additional upper division units in Botany or related natural science courses	10
Total Units for the Major	69-74

Recommended

Bacteriology 2 or 102, 3; Botany 114 or 118, 119; Chemistry 1C; Mathematics 13.

Botany

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	63
Bacteriology 2 or 102; 3 (Students who have completed Bacteriology 105 and 106 are not required to take courses 2 and 3)	5
Biological Sciences 1	5
Botany 2	5
Zoology 2	6
Chemistry 1A, 1B, 1C	15
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Physics 2A, 2B, 2C	9
Mathematics 13	4
Depth Subject Matter	45
Biochemistry 101A, 101B	6
Botany 105, 108, 111A, 111B, 116	21
Genetics 100A, 100B	6
Botany courses from one of the following three categories, depending upon specified area of major interest	5-10
(a) Morphology or taxonomy, Botany 118, 119;	
(b) ecology, Botany 114, 117;	
(c) biochemistry or physiology, Botany 114.	
Additional upper division units in Botany or related natural science courses to achieve a total of at least 45 upper division units	2-7
Total Units for the Major	99-108

Recommended

Chemistry 5; Mathematics 16A-16B-16C or 21A-21B-21C (especially for students whose major interests are ecological, biochemical, or physiological); German, French or Russian.

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 68

College of Letters and Science students

Refer to page 92 for a description of requirements to be completed in addition to the major

Major Advisers. K. Wells, T. L. Rost, T. M. Murphy.

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 69 and 99 for Dean's Honors List information.

Teaching Credential Subject Representative. K. Wells. See page 107 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,

Thornton; III, Rost
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) II. 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.)

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. Radosevich
Lecture—2 hours; weekend field trips—4 to 8 days. Prerequisite: upper division standing and consent of instructor; course 2 recommended. The structure of selected plant communities and the relationship of the component species to the environment. Recommended for nonmajors.

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. Pearcy; II, _____
Lecture—3 hours. Prerequisite: course 2; Chemistry 8B (may be taken concurrently). The 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, Thornton
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) I, III. Stacking
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 (5) II. Gifford
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2; course 105 recommended. Structure, reproduction and evolution of the major groups of living and extinct vascular plants; emphasis given to seed plants. Campus botanical tours; preparation of fossil "peels."

117. Plant Ecology (4) I, Barbour; II, Pearcy; III, Major
Lecture—3 hours; several Friday or Saturday field trips. Prerequisite: plant physiology (course 111B) and plant identification (course 102 or 108) 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. Sight identification of common weeds and demonstrations to illustrate the principles.

121. Biology of Weeds (3) III. Norris
Lecture—2 hours; laboratory—3 hours. Prerequisite:

course 2. Origin and evolution, beneficial and harmful aspects, reproduction and dispersal, seed germination and dormancy, growth and development, ecology, interaction of weeds and crops, natural succession, and herbicide induced succession. Laboratories will emphasize taxonomy of weeds and demonstrate principles discussed in lectures.

122. Action of Herbicides (3) I, Ashton, Radosevich
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 120; Soil Science 2; courses 111A, 111B recommended. The influence of plants and soils on the action of herbicides. Absorption, translocation, fate, mechanism of action and symptoms of herbicides in plants. The 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; Genetics 100B or Biochemistry 101A. An analysis of the structure and ultrastructure of cells; the relationship between structure and function at cellular and subcellular 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. Introduction to Forest History (5) I, Axelrod
Lecture—2 hours; laboratory—6 hours; one-day or two-day weekend field trips. Prerequisite: course 101 recommended. Development of modern vegetation, with emphasis on centers of origin and radiation; rates of evolution, and the factors controlling them.

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 flora and vegetation.

142. Evolution of Plant Ecosystems (4) II, Axelrod
Lecture—2 hours; one-day or two-day weekend field trips. Prerequisite: courses 101, 140, or 141 recommended. Evolutionary history of mixed mesophytic forest, conifer-hardwood forest, boreal forest, rainforest, and others.

155. Plant Microtechnique (4) III, Gifford
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.)

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

201. Advanced Biological Ecology (4) II, Salt, Major, Valentine
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. (Same course as Ecology 201, Geology 201, and Zoology 201.)

205A. Advanced Plant Physiology (3) I, Currier
Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101A (may be taken concurrently). Cellular physiology, plant water relations, translocation, and mineral nutrition.

205B. Advanced Plant Physiology (3) II, Castelfranco
Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101B (may be taken concurrently). 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 (2) I.
Laboratory—6 hours. Prerequisite: course 205A (may be taken concurrently); Biochemistry 101L. Laboratory procedures in advanced plant physiology. Experiments designed to follow subject-matter sequence of course 205A.

206B. Advanced Plant Physiology Laboratory (2) II, Castelfranco
Laboratory—6 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 (2) III, Bonner
Laboratory—6 hours. Prerequisite: course 205C (may be taken concurrently). Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205C.

***211. Plant Cell Metabolism** (4) II, Stocking
Lecture—2 hours; laboratory—6 hours. Prerequisite: consent of instructor. Plant cell physiology, dealing particularly with the roles of plastids, mitochondria, microsomes, and nuclei in cellular metabolism. Isolation and study of these particulates, using centrifugation, gasometric, chromatographic, and spectroscopic methods.

***212. Physiology of Herbicidal Action** (3) I, Ashton
Lecture—3 hours. Prerequisite: course 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) II, 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.

***216. Advanced Morphology of Vascular Plants** (3) I, Gifford
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 116. Evolution of form, structure, and reproduction of fossil and extant types through Cycadophytes.

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 or measurement 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, Bayer; II, Norris; III, Ashton
Seminar—2 hours. Analysis in depth of recent advances in plant physiology. Lectures and discussions by research specialists. Students prepare an abstract/summary in the area of one or more 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—atomy, 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. The study of variation in natural populations in relation to taxonomy; the application of population sample analysis, cytogenetics, transplant studies, etc., to the solution of taxonomic problems and the clarification of relationships.

257. Plant Autecology (3) I, Major
Lecture—3 hours. Prerequisite: course 117, Mathematics 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, Norris; II, Ashton; III, Axelrod
Seminar—1 hour. (S/U grading only.)

NOTE: For key to footnote symbols, see page 132.

Chemistry

291. Seminar in Plant Morphology (1) I, Webster; II, Tucker
Seminar—1 hour. (S/U grading only.)

292. Seminar in Plant Physiology (1) I, Bonner, III, Bayer
Seminar—1 hour. (S/U grading only.)

293. Seminar in Weed Science (1) II, Radosevich
Seminar—1 hour. (S/U grading only.)

294. Seminar in Cytology and Cytobiochemistry (1) III, Falk
Seminar—1 hour. Survey of current research developments in the fields of cytology and biochemistry with special reference to plants. Discussion of the fine structure of cells in relation to biochemical function. (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. (Same course as Plant Pathology 295.) (S/U grading only.)

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)

David H. Volman, Ph.D., Chairperson of the Department

Department Office, 108 Chemistry Building

Faculty

Thomas L. Allen, Ph.D., Professor
Lawrence J. Andrews, Ph.D., Professor
Alan L. Balch, Ph.D., Associate Professor
Donald E. Bergstrom, Ph.D., Assistant Professor
Albert T. Bottini, Ph.D., Professor
Robert K. Brinton, Ph.D., Professor (*Emeritus*)
William H. Fink, Ph.D., Associate Professor
Edwin C. Friedrich, Ph.D., Professor
Kenneth G. Hancock, Ph.D., Associate Professor
Daniel C. Harris, Ph.D., Assistant Professor
Hakon Hope, Cand. real, Professor
Raymond M. Keefer, Ph.D., Professor
Joel E. Keizer, Ph.D., Associate Professor
Richard E. Kepner, Ph.D., Professor
Gerd N. LaMar, Ph.D., Professor
August H. Maki, Ph.D., Professor
Claude F. Meares, Ph.D., Assistant 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
Carl W. Schmid, Ph.D., Assistant Professor
Neil E. Schore, Ph.D., Assistant Professor
Leo H. Sommer, Ph.D., Professor
James H. Swinehart, Ph.D., Professor
Dino S. Tinti, Ph.D., Associate Professor
David H. Volman, Ph.D., Professor
George S. Zweifel, Sc.D., Professor

The Major Programs

Students who are interested in chemistry as a profession should elect the program leading to the Bachelor of Science degree. Those desiring a less intensive program in chemistry should elect the program leading to the Bachelor of Arts degree. 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 degree is simplified if their high school programs include chemistry and four years of mathematics.

Candidates for the bachelors' degree in chemistry will receive upper division credit for those lower division chemistry courses accepted in lieu of upper division courses required for the major.

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	53-57
Chemistry 1A-1B-1C-5 or 4A-4B-4C	15-19
Physics 4A, 4B, 4C, 4D, 4E	20
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, K. G. Hancock, J. E. Keizer, R. E. Kepner, C. F. Meares, L. H. Sommer, 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 107 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, Allen, Keefer, Swinehart; II, Keizer, LaMar
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) II, Balch, Keefer, Musker; III, Balch, Meares
Lecture—3 hours; laboratory—6 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, Musker; III, Fink, Rock
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 1B or 4B. Students with credit for course 4B may enroll in course 1C for 4 units only. Continuation of course 1B. Chemical kinetics, structures and reactions of complex ions and molecules, application of principles of chemistry to problems of qualitative analysis.

4A. General Chemistry (5) I, Maki
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, Harris
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, Hope
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, Harris; III, Brinton
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1C with a grade of C or higher. Students who have credit for the sequence 4A, 4B, 1C may enroll in course 5 for 2 units of credit. Not open to students who have credit for 4A, 4B, 4C. An introduction to the principles and methods of quantitative chemical analysis with emphasis on the application of equilibrium theory to analytical problems.

8A. Organic Chemistry: Brief Course (3) I, Sommer; II, Friedrich; III, _____
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, _____; 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.

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 (Volman 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, Nash

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 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, Meares, 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 (3) I, Schmid, Volman; III, Keizer

Lecture—3 hours. Prerequisite: course 5; Mathematics 21C or the equivalent or 16C; one year of college physics. Development of the principles of classical thermodynamics; emphasis on criteria for the existence and maintenance of equilibrium.

110B. Physical Chemistry (3) I, Fink; II, Maki

Lecture—3 hours. Prerequisite: course 110A. Continuation of course 110A with emphasis on solution thermodynamics, kinetic theory, and chemical kinetics.

110C. Physical Chemistry (3) II, Fink; III, Volman

Lecture—3 hours. Prerequisite: course 110B. Continuation of course 110B with emphasis on solution thermodynamics, kinetic theory, and chemical kinetics.

111A. Physical Chemistry: Methods and Applications

(4) I, Hope; II, _____
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, _____
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, Maki
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, Swinehart

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.

125. Methods of Inorganic Chemistry (4) III, Musker

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124. Discussion and application of the chemical and physical methods used to synthesize and characterize inorganic compounds and to study their reactivity.

***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, Bergstrom; II, Schore; III, Andrews

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, Bottini; II, Kepner; III, Bergstrom

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, Bergstrom; III, Hancock

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, Friedrich; II, Miller; III, Schore

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, Bergstrom

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, Bergstrom; III, Hancock

Laboratory—6 hours. Prerequisite: courses 128C (may be taken concurrently) and 129B. Continuation of course 129B.

130. Qualitative Organic Chemistry (4) III, Zweifel

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: courses 107B or 110B, 128C, or consent of instructor. Introduction to modern synthetic methodology in organic chemistry with emphasis on stereoselective reactions and application to multistep syntheses of organic molecules containing multifunctionality.

150. Chemistry of Natural Products (3) I, Miller

Lecture—3 hours. Prerequisite: courses 107B or 110B, and 128C. Chemistry of carbohydrates and lipids: structure proof, stereochemistry, conformation, substitutions, and rearrangements of model systems.

194H. Undergraduate Research (2-5) I, II, III. The Staff (Volman 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 (Volman in charge)

Discussion and/or laboratory. Prerequisite: consent of instructor. Participation may include development of laboratory experiments, lecture demonstrations, auto-tutorial 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 (Volman 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 (Volman 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, Fock
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, Allen

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, Root

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, 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.

Classics

224. Inorganic Chemistry (3) I, Harris

Lecture—3 hours. Prerequisite: course 124. Development of the modern theories related to the structural, optical, and magnetic properties of inorganic compounds and complexes. Offered in odd-numbered years.

225. Inorganic Chemistry (3) I, Balch

Lecture—3 hours. Prerequisite: course 124. Application of kinetic and thermodynamic principles to the interpretation of inorganic systems. Offered in even-numbered years.

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, Hancock

Lecture—4 hours. Modern concepts of substitution, elimination, and addition reactions, rearrangements, and stereochemistry.

290. Seminar (1) I, II, III, Allen, Hancock, LaMarr

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

298. Group Study (1-5) I, II, III, The Staff (Chairperson in charge)

299. Research (1-12) I, II, III, The Staff (Chairperson in charge)

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

Chinese

See Oriental Languages

Classics

(College of Letters and Science)

Department Office (Spanish and Classics), 606 Sproul Hall

Faculty

Richard E. Grimm, Ph.D., Associate Professor
Wesley E. Thompson, Ph.D., Professor
David A. Traill, Ph.D., Assistant Professor
Frederick H. van Doorninck, Jr., Ph.D., Associate Professor

The Major Programs

Two major programs, one in Greek and one in Latin, consist of the detailed study of the great works of Greek or Latin literature in the original languages including epic, drama, philosophy, history, and oratory. This gives the liberal arts major an opportunity to study in depth a civilization that has profoundly influenced the western world.

These two programs are also excellent preparation for graduate study in classics, ancient history, philosophy, and archaeology.

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)	36
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. W. E. Thompson (Greek); and R. E. Grimm (Latin).

Teaching Credential Subject Representative. R. E. Grimm. See page 107 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.

COURSES IN CLASSICS

Lower Division Courses.

***4A. Classical Civilization** (3) III, Thompson
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, van Doorninck
Lecture—3 hours. The archaeological monuments of 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, van Doorninck
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, Traill
Lecture—3 hours. The development of Rome and its Empire as illustrated by the monuments.

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) III, 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, van Doorninck
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, van Doorninck
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, van Doorninck
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. Not open for credit to students who have completed the first two years of high school Greek.

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, van Doornick
Recitation—3 hours; term paper. Prerequisite: course 3.

***103B. Homer: Odyssey** (4) II. van Doornick
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.

98. 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. Not open for credit to students who have completed the first two years of high school Latin.

NOTE: For key to footnote symbols, see page 132.

***1X. Intensive Latin** (9) 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) II. 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) I.
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.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (2-5) I, II, III. The Staff (Grimm in charge)
(P/NP grading only.)

Graduate Course

299. Research (2-5) 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, 1165 Haring Hall

Faculty

Edward J. Carroll, Ph.D., Lecturer
Nemi C. Jain, M.V.Sc., Ph.D., Associate Professor
Donald E. Jasper, D.V.M., Ph.D., Professor
Jiro J. Kaneko, D.V.M., Ph.D., Professor
Kerry S. Keeton, D.V.M., Ph.D., Assistant 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
Lecture—2 hours. Prerequisite: Biological Sciences 1, Physiology 101, 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
Laboratory—6 hours. Prerequisite: course 101 (should be taken concurrently) and consent of instructor. Introduction to laboratory methods and procedures of clinical hematology. Limited enrollment.

102. Clinical Biochemistry (3) II. Kaneko
Lecture—2 hours; laboratory—2 hours. Prerequisite: Physiology 110A-110B; 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. Offered in even-numbered years.

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) II. Schalm
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) III. Jain
Lecture—2 hours. Prerequisite: course 101, Biochemistry 101A-101B, or consent of instructor. Metabolism, ultrastructure, kinetics, homeostasis, cytochemistry, and func-

Community Nutrition; Comparative Literature

tions 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, Lewis (Medicine), M. 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.

207. Clinical Cytology (2) II. Keeton
Lecture—1 hour; laboratory—2 hours. Prerequisite: third-year standing in the School of Veterinary Medicine or consent of instructor. Cytology of serous effusions (benign and malignant, inflammatory and noninflammatory), joint fluids, cerebrospinal fluids and other body fluids. Impressions and aspiration smears of various tissues and organs. Methodology, interpretation, and their applications in disease.

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)
Seminar—1 hour.

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

The Community Nutrition program prepares you for work with public and private community agencies dealing with normal nutrition, therapeutic nutri-

tion, malnutrition, and related social problems. Areas of learning include the biological and behavioral sciences, food science, nutrition science, and community nutrition. The major enables you to qualify for graduate admission into some master's degree programs in Public Health Nutrition, greatly increasing career opportunities.

By selecting appropriate additional courses, † you may also fulfill the academic requirements for admission to an approved internship in Dietetics and to additional master's degree programs in Public Health Nutrition.

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	45-46
Written expression (English 1, 2, 5F)	4
Oral expression (Rhetoric 1 or 3)	4
Statistics (Mathematics 13 or Economics 12)	4-5
Chemistry 1A-1B, 8A-8B	16
Biology (Biological Sciences 1)	5
Physiology with laboratory (Physiology 101, 101L)	7
Bacteriology with laboratory (Bacteriology 2, 3)	4
Depth Subject Matter	44-45
Nutrition 101, 102, 102L (or 110, 111, 111L)	9-10
Nutrition 116A-116B	6
Nutrition 118-118L, 119	7
Food Science and Technology 100A, 100AL, 100B, 100BL	10
Consumer Economics 141, 142	8
Breadth Subject Matter	38
Principles of economics (Economics 1A)	5
General psychology (Psychology 1)	4
Sociology, social problems, race relations, social systems in urban society (Sociology 3, 130, 143)	12
Cultural anthropology (Anthropology 2)	4
Applied Behavioral Sciences 47, 151	6
Human Development 100A	4
Methods of teaching (Applied Behavioral Sciences 173)	3
Unrestricted Electives	51-53
The following courses are recommended depending upon a specific career objective: Economics 1B; Biochemistry 101A-101B; Nutrition 114; Food Science and Technology 107; Human Development 100B, 110; Food Service Management 120, 120L, 121, 122, 123; Applied Behavioral Sciences 151; International Agricultural Development 10.	
Total Units for the Major	180

Major Adviser. F. J. Zeman (*Nutrition*).

Graduate Study. See page 101 and the *Announcement of the Graduate Division*.

†To fulfill the academic requirements for an internship in Dietetics add: Agricultural Economics 112; Biochemistry 101A-101B, and Food Service Management 120, 120L, 121, 122, 123.

Comparative Literature

(College of Letters and Science)

Program Office, 724 Sproul Hall or 4208 Storer Hall

Committee in Charge

Roland W. Hoermann, Ph.D. (*Comparative Literature, German*). Committee Chairperson
Ruby Cohn, Ph.D. (*Comparative Literature, Dramatic Art*)
Andrew G. Comings, Ph.D. (*Russian*)
Alfonso DePetris, Dottore in Lettere (*Italian*)
Peter L. Hays, Ph.D. (*English*)
Manfred Kusch, Ph.D. (*French*)
Hugo J. Verani, Ph.D. (*Spanish*)

Faculty

Harriet Blodgett, Ph.D., Lecturer (*English*)
Ruby Cohn, Ph.D., Professor (*Comparative Literature, Dramatic Art*)
John F. Fetzer, Ph.D., Professor (*German*)
Thomas A. Hanzo, Ph.D., Professor (*English*)
Roland W. Hoermann, Ph.D., Associate Professor (*Comparative Literature, German*)
Jan Hokenson, Ph.D., Lecturer (*French*)
Manfred Kusch, Ph.D., Assistant Professor (*French*)
Isaiah Smithson, M.A., Lecturer (*English*)
Robert M. Torrence, Ph.D., Associate Professor (*Comparative Literature*)
Marian B. Ury, Ph.D., Assistant Professor (*Comparative Literature and Religious Studies*)

The Major Program

Comparative Literature is the intercultural study of the literary arts as they undergo change in such structural, stylistic, and ideological sectors as the following: (1) imagery, genres, and poetical devices; (2) themes, taste, and historical crosscurrents; (3) archetypal myth and folklore; (4) theory of literature and literary criticism; and (5) interdisciplinary relationships with philosophy, theatre and cinema, the fine arts, and with various social sciences. Among the goals of the undergraduate curriculum are: acquiring an integrated sense of cross-cultural literary history; undertaking methodological inquiries involving more than one literature in the original languages; comprehending the phenomenon of craftsmanship in significant literary works; and delineating the imaginative dimension in analogous literary statements, irrespective of chronological, geographic and linguistic origins.

Upon declaring the major, each student should designate a primary or "first literature of concentration" and a supporting or "second literature of concentration." The proposed plan of study in the major is then submitted to each of the two advisers concerned for their approval. Official advisers for literature combinations acceptable under this major at Davis are listed below, together with their departmental affiliations.

Comparative Literature

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	13-43
Comparative Literature 40	4
Classics 10, 40, 41	9
Foreign language: sufficient preparation to insure satisfactory performance in first and second literatures of concentration on the upper division level	0-30
Depth Subject Matter	53
Six upper division courses (in original language) in first literature of concentration. Including appropriate historical distribution	24
Three upper division courses (in original language) in second literature of concentration	12
Two courses from Comparative Literature 140, 141, 142	8
Comparative Literature 100, at least 1 unit (initial enrollment no later than final junior quarter)	1
Two upper division literature courses exclusive of first and second literatures of concentration. (These may include foreign literature in translation or additional Comparative Literature courses.)	8
Total Units for the Major	66-96

Recommended

Art 10; Dramatic Art 15, 20; History 4A, 4B, 4C; Philosophy 6, 21, 22.

Major Advisers. R. E. Grimm (Classics); D. A. Robertson (English); M. Kusch (French); K. Menges (German); G. Foscarini (Italian); A. G. Comings (Russian); D. T. Jaén (Spanish).

Teaching Credential Subject Representative. R. W. Hoermann. See page 107 for the teacher Education Program.

COURSES IN COMPARATIVE LITERATURE

Lower Division Courses

10A-L. Masterpieces of World Literature (2) I, II, III. (The Staff (Chairperson in charge))

Lecture-discussion—one 2-hour evening 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, Galdós, Ibsen; (K) Balzac, Dostoevski/Tolstoi, Hardy, Shaw, Strindberg; (L) Unamuno, Svevo, Conrad, Gide, Kafka, Faulkner. May be repeated for credit in different subject area. Limited enrollment. (P/NP grading only.)

40. Introduction to Comparative Literature (4) I, Torrance

Lecture—2 hours; discussion—1 hour; term paper. Survey of the methods of comparativist investigation; analysis of the literary work of art; genres, structures, and literary devices; archetypes and transformations in representative models.

49. Freshman Seminar: The Limits of Literary Communication (2) I, The Staff (Chairperson in charge)

Seminar—2 hours. Introductory comparative studies in the basic ideas and ideals of the world's "universal" writers. Topics include the vision of utopian community; self-portraits of the creative process; authorial recall as exorcism, as reality inversion, and as "gamesmanship"; and the literary language of the dream and silence. (P/NP grading only.)

50. Intermediate Seminar: Myths and Motifs (2) II. The Staff (Chairperson in charge)

Seminar—2 hours. Comparative studies focusing on aesthetic myth as the representation of man's collective struggle for coherence in nature and for meaning in the mortal destiny. (P/NP grading only.)

51. Intermediate Seminar: Form and Phantasy (2) III. The Staff (Chairperson in charge)

Seminar—2 hours. Classic examples from various literatures of individual reality in conflict with convention: the romances of knighthood literary hedonism; the transition from hero to anti-hero; evil and the supernatural in literature. (P/NP grading only.)

52A-52B. Intermediate Seminar: The Orient and the West (2) II. Ury

Seminar—2 hours; seminar reports. Knowledge of an Oriental language not required. Seminar lectures and discussion will focus on a few selected longer works of literature and explore their meaning for both East and West. Content will alternate among the following segments: A. *The Tale of Genji* as English literature; B. "Family Novels," such as *The Dream of the Red Chamber* and *Buddenbrooks*. May be repeated for credit in different subject area. (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 (Chairperson in charge)

Restricted to lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Upper Division Courses

100. Majors Colloquium (1) III. The Staff (Chairperson in charge)

Seminar—1 hour. Weekly presentations and discussions of topics appropriate to the comparative study of literature. Enrollment required for at least one quarter of all majors and no later than their junior year. May be repeated for credit for a total of 4 units. (P/NP grading only.)

140. The Comparative Study of Literature (4) II. The Staff (Chairperson 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. Theories of Literature and the Techniques of Literary Criticism (4) III. Torrance

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: reading knowledge of one foreign language or consent of instructor and completion of 8 units of upper-division literature course work. Exploration of literary theories with emphasis on specific objectives and possibilities of comparative literature. May be repeated for credit.

***142. Critical Reading and Analysis** (4) I. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—1 hour; term paper. Pre-

quisite: 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 (Chairperson 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) II. Hays

Lecture—2 hours; discussion—1 hour; term paper. The changing image of man and his world as seen in the novels by such writers as Dostoevski, Svevo, Kafka, Faulkner, and Robbe-Grillet.

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-D. Varieties in Authorial Vision (4) I, II, III. Cohn

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Study of representative examples of imaginative literature from antiquity to the present. Content will alternate among the following segments: A. *The Tragic Vision*; B. *The Comic Vision*; C. *The Tragicomic Vision*; D. *The Mythological Perspective*. May be repeated for credit in different subject area.

***162A-F. The Theory and Practice of Literary Translation** (4) II. The Staff

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; imaginative equivalence and re-creative adaptation demonstrated in terms of various models; comparison of student translation projects. Content will alternate among the following segments: A. French to English; B. German to English; C. Greek/Latin to English; D. Italian to English; E. Russian to English; F. Spanish to English. May be repeated for credit in different subject area.

163A-E. Literature and the Other Arts (4) II. The Staff

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. The encounter of literature with other art forms; structural and thematic elements of music and the fine arts reflected as subject matter or compositional principles in literature; contrast and similarity in the creative process of the several media. Content will alternate among the following segments: A. Music and the Artist-Hero; B. Pictorial Arts and Visual Media; C. Theater, Opera and Dramatic Forms; D. The Role of Imagination and the Creative Process in Literature and other Arts; E. Cinema as Narrative Literature. May be repeated for credit in different subject area.

164A-C. The Great Periods of International Culture (4) III. Torrance

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in the literary cross-currents, accommodation and dominance that have characterized the literatures of a common Western culture. Content will alternate among the following segments: A. The Middle Ages; B. The Renaissance; C. Rationalism and the Enlightenment. May be repeated for credit in different subject area.

***165. Studies in Fantastic Reality** (4) III. Hoermann

Lecture—2 hours; discussion—1 hour; term paper. The literary experience of mystery, the fantastic, and the demonic in Western tradition, including works by such writers as Borges, Dostoevski and Kafka.

166A-I. Longer Narrative Forms: The Epic and the Novel (4) III. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in standard epic and novelistic forms, analysis of national and individual variations to show convergence or divergence in the evolving narrative consciousness. Readings in English except for majors in this concentration area. Content will alternate among the following segments: A. Arthurian Romance;

NOTE: For key to footnote symbols, see page 132.

Consumer Economics; Consumer Food Science; Consumer Science

B. Heroic; C. Picaresque; D. Confessional; E. Novel of Maturation (*Entwicklungsroman*); G. Artist Novel (*Kunstlerroman*); F. War Novels; H. Stream-of-Consciousness Mode; I. Utopian/Dystopian Novels. 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-E. Modern Literary Movements and Styles (4) I. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: consent of instructor. Studies in popular taste, messianic vision, and elitist polarities. Content will alternate among the following segments: A. Romanticism; B. Symbolist Poetry and Poetics; C. Naturalism and Expressionism; D. Utopianism and Authoritarian Structures; E. Quests of Mystery and Science Fiction. May be repeated for credit in different subject area.

*169A-D. The Avant Garde (4) II. Kusch

Lecture—2 hours; discussion—1 hour; term paper. Literary innovation and rebellion in Western Culture since World War I. Content will alternate among the following segments: A. Dada and Surrealism; B. The Absurdist Tradition; C. The "New Novel"; D. Proletarian and Epic Theater. May be repeated for credit in different subject area.

170A-D. The Literary Imagination of China and Japan (4) III. Ury

Lecture—2 hours; discussion—1 hour; term project. Knowledge of an Oriental language not required. Selected topics in Chinese and Japanese literature, drawing on a broad range of literary works from both cultures, including comparison with Western literary examples. Content will alternate among the following segments: A. Man, Time, and Nature; B. Fantasy and Reality; C. Love and War; D. Literary Convention and Lyric expression. May be repeated for credit in different subject area.

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 (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.)

Related Courses. See Agricultural Economics.

COURSES IN CONSUMER ECONOMICS

Questions pertaining to the following courses should be directed to the instructor or to the College Office, 228 Mrak Hall.

Upper Division Courses

141. Consumers and the Market (4) I, Zoloth; II, Lane
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.

142. Consumer Economic Problems (4) II, Shepard; III, Lane
Lecture—4 hours. Prerequisite: Economics 1B. The management of income and expenditures by the household. The use of consumer credit, savings, investments, and insurance by households.

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

247. The Economics of Consumption (4) II. Zoloth
Lecture—4 hours. Prerequisite: course 141 and one year of intermediate economics, or consent of instructor. An analytical treatment of household consumer behavior, consumption patterns and consumption trends; the effects of income, prices, and household characteristics on expenditures; levels of consumption; economic theory of consumer behavior.

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 major in Consumer Food Science is designed to provide you with a background in the biological and social sciences sufficient to prepare you for a career dealing with the utilization of foods by the consumer. Emphasis is placed on both the biological properties of foods and on the biological, natural, and social sciences to prepare you for a career such as food product development, quality assurance, marketing and sensory analysis, extension service, creative writing, and community service.

The major provides academic preparation if you plan to pursue a teaching credential or to undertake graduate study in food or consumer science.

Consumer Food 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. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	59
Biochemistry (Biochemistry 101A-101B)	6
Biology with laboratory (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A-1B-1C, 8A-8B)	21
Mathematics, statistics and physics (Mathematics 19, Agricultural Science and Management 150, Physics 10)	10
Microbiology with laboratory (Bacteriology 2, 3)	4
Physiology (Physiology 101)	5
Written and oral expression (English 1, Rhetoric 1)	8
Depth Subject Matter	48
Community nutrition (Nutrition 118, 118L)	4
Consumer economics (Consumer Economics 141, 142)	8
Food Science and Technology including 100A, 100AL, 100B, 100BL, 107, 112, 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	24
Principles of economics (Economics 1A-1B)	10
At least one course from two different areas: Applied behavioral sciences, consumer sciences, cultural anthropology, psychology, or sociology. Remainder in social sciences and humanities electives	14
Restricted Electives	20
Food related courses selected in accordance with student's educational goal with approval of adviser	
Unrestricted Electives	29
Total Units for the Major	180

Major Adviser. T. A. Nickerson (*Food Science and Technology*).

Graduate Study. Related graduate study and research leading to the M.S. degrees in Food Science or Consumer Science is available. See page 101 and the *Announcement of the Graduate Division* for details on graduate study.

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 171); and for related graduate study see page 101.

Consumer Science

(College of Agricultural and Environmental Sciences)

Faculty

See under the Textiles and Clothing Division and the Department of Food Science and Technology

Major Programs and Graduate Study

Consumer Food Science (page 168) and Home Economics (page 230) are related majors; for graduate study see page 101.

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 College Office, 228 Mrak Hall.

Lower Division Course

47. Food Product Development Field Study (1) III. Schutz
Discussion—three 2-hour sessions; field trip—2 days. To observe commercial aspects of the large-scale development, distribution and evaluation of food products intended for human consumption. Course given between Winter and Spring Quarters and considered a Spring course for pre-enrollment. Advance enrollment with instructor required. (P/NP grading only.)

Upper Division Courses

100. Consumer Behavior (3) I, The Staff (Schutz in charge)
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 foods or 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. Bruhn
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 Bruhn
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.

198. Directed Group Study (1-5) I, II, III. The Staff (Schutz 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 (Schutz 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.

201A. Consumer Product Quality, Standards, and Labeling: Basic Principles (2) I, Needles
Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. An overview of consumer product quality, standards for consumer products, informative product labeling, and the relationships of quality, standards and labeling are presented.

ity, standards for consumer products, informative product labeling, and the relationships of quality, standards and labeling are presented.

***201B. Consumer Product Quality, Standards and Labeling: Textile Products and Hard Goods** (2) II. Zeronian
Lecture—2 hours. Prerequisite: course 201A and Textiles and Clothing 160 recommended. Consumer product quality and standards for textile products; shelter, transportation, appliances, and repair are given more limited coverage.

201C. Consumer Product Quality, Standards, and Labeling: Food and Nutrition Practices and Problems (2) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 201A and upper division courses in foods (Food Science and Technology 100A, 100B or the equivalent) and Nutrition (102A, 102B or equivalent) recommended. Relation of consumer problems in nutrition and food use to regulations and practices involving quality, standards, and labeling of food products. Topics include food grades and standards; identity standards; labeling for regulation and for information; fortification and enrichment of foods; nutritional supplements and substitutes; food additives.

202. Consumer Protection (4) III. Shepard
Lecture—3 hours; discussion—1 hour. Prerequisite: knowledge equivalent to Consumer Economics 141, 142. Consumer protective agencies and programs: federal, state, and local government programs; private consumer protective agencies and programs; nonprofit agencies and programs; consumer legal remedies; consumer protective legislation and enforcement of consumer protective regulation and legislation.

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.

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. (S/U 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) I, II. 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. 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. Selected operations of welding, cutting, forming, and finishing. (P/NP grading only.)

17. Electrical Appliances and Systems (1) III. Dobie
Lecture—1 hour. Characteristics and principles of selected electrical appliances and systems for lighting, heating, and power. Principles of electricity; loads, distribution, and control; safety; planning systems and selecting appliances.

17L. Laboratory Exercises for Electrical Appliances and Systems (1) III. Dobie
Laboratory—2 hours. Prerequisite: course 17 (concurrently). Directed laboratory exercises, field trips, and special projects to augment the study of course 17. (P/NP grading only.)

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.

22L. Land Vehicles Laboratory (1) I, Goss
Laboratory—2 hours. Prerequisite: course 22 (concurrently). Directed laboratory exercises, field trips, and special projects to augment the study of course 22. (P/NP grading only.)

31. Using Calculators and Computers for Records and Problems (1) I, II, III. Chen, Goss
Discussion-laboratory—2 hours. Directed exercise 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 (Fridley 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 (Fridley in charge)
(P/NP grading only.)

Upper Division Courses

100. Social Implications of Mechanization in Agriculture (2) III. O'Brien
Lecture—2 hours. Prerequisite: upper division standing or consent of instructor. Roles of rural manpower and mechanization in the production of food and fiber. Pressures for mechanization and social implications of the resulting developments. Technological considerations in developing machines. Human benefits and stresses resulting from increased levels of mechanization. Offered in even-numbered years.

101. Engines for Automotive, Agricultural, Residential, and Recreational Use (3) II. Goss
Lecture—2 hours; laboratory—2 hours. Prerequisite: upper division standing or consent of instructor. Principles of engine construction, operation, performance, and utilization. Engine fuel resources and properties of fuels, lubricants, and engine exhaust. Fuel 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. Miller
Lecture—1 hour. Prerequisite: upper division standing;

NOTE: For key to footnote symbols, see page 132.

Design

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. Miller
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 exercise 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 (Fridley in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Fridley 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 De-	

sign 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. J. A. Stabb (*Applied Behavioral Sciences*).

Related Courses. See Engineering 110, Environmental Planning and Management 20, 22, 136.

COURSES IN DESIGN

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 120 AOB IV.

Lower Division Courses

6A-6B-6C. Visual Communication Through Design (4-4-4) I, Berteaux; II, Rapoport; 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. Stabb, Rossbach
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. Olsen, Butler
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) III. Butler
Studio—8 hours.

21. Drafting and Perspective (4) I, II, III. Olsen
Studio—8 hours. Prerequisite: course in drawing recommended. Creation of three-dimensional designs on two-dimensional surfaces.

22. Lettering and Type Design (4) I, Butler
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) I, II, III. Rapoport
Studio—8 hours. Contemporary approach to non-loom textile techniques; netting, plaiting, knotting, and basketry.

25. Reproduction Graphics (4) II. Butler
Studio—8 hours. Basic studio and photographic skills for the designer; continuous tone, line and halftone films, mechanical and four-color screen separations.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

26. Visual Presentation (4) I, Gotelli
Studio—8 hours. Exploration of communication through display and exhibition design.

60. Concepts in Textile Dyeing and Printing (3) II. Needles (Textiles and Clothing)
Lecture—2 hours; laboratory—3 hours. Prerequisite: Textiles and Clothing 6 recommended. Basic principles and relationships in dyeing and printing processes on textiles; dye classification; fiber receptiveness; effect of physical variables and additives on dyeing and printing, and fixation of dye are considered. Relative dye colorfastness, dyebath and printing compositions, and common colloquialisms are considered.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Thompson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

130. Model Construction (4) III. Olsen
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) III. Rossbach
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, II, III. Rapoport
Studio—8 hours. Prerequisite: course in non-loom textiles recommended. Influences of material and techniques of the woven form of tapestry weaving and frame loom weaving, natural dyeing and simple loom construction.

133. Graphic Communication Design (4) II. Butler
Studio—8 hours. Prerequisite: course 22 recommended. Study and practice of layout skills in poster, book, magazine, and TV design. Exploration of the social impact and application of communication media.

134. Environmental Design (4) I, Berteaux; II, Gotelli
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) II. 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.
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.
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, Rossbach
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. Rossbach
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.

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) I-II-III. Ross-

bach, Rapoport
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.

Rapoport, 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, Olsen; II, Berteaux; 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. The Staff

Seminar—2 hours. Prerequisite: design major or consent of instructor. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

(Thompson 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 (Thompson 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 organiza-

tions, 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
English (choose from English 1, 2, 3, 4A, 4B, 5F or 5P)	4
English (from the above) or rhetoric (Rhetoric 1 or 3)	4
American History and Institutions†	8
Economic principles (Economics 1A-1B)	10
Statistics (Mathematics 13)	4
Mathematics, including calculus	6
Depth Subject Matter	38-40
Theory: Agricultural Economics 100A-100B-100C, Economics 101	14
Statistics: choose two courses from Agricultural Economics 106A, 106B, 155	6
Senior Research: Agricultural Economics 190A, 190B	4
Policy and Planning: choose four courses from Agricultural Economics 120, 148; Economics 125A, 125B, 130, 131, 152; Applied Behavioral Sciences 151, or the equivalent ...	14-16
Breadth Subject Matter	32
Natural sciences (including mathematics beyond Preparatory Subject Matter above) and agriculture (excluding agricultural economics and consumer economics)	12 units minimum
Social sciences (excluding economics), history, and philosophy	12 units minimum
Restricted Electives	20
Specialization requirement (select one or more from the following in the designed area of specialization‡	
Development economics: Agricultural Economics 148; Natural resource economics: Agricultural Economics 176; Human resource economics: Agricultural Economics 150; Consumer economics: Consumer Economics 141, 142	
Unrestricted Electives	52-54
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. J. Foytik (Agricultural Economics)

†Students meeting the American History and Institutions requirement may substitute Social Science as interpreted under the Social Sciences Breadth Subject Matter requirement.

‡Additional restricted electives to be recommended by adviser.

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.

It may be necessary to limit enrollment in this major due to limitation of UCD resources.

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 expression (English 1)	4
Oral expression (Rhetoric 1, 3)	4
Statistics (Mathematics 13 or Economics 12)	4-5
Physics (Physics 2A-2B-2C or 10 or Agricultural Engineering Technology 121, 121L, Consumer Technology 17, 17L)	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)	1-3
Depth Subject Matter	61-83
Biochemistry (Biochemistry 101A, 101B)	6
Physiology (Physiology 101, 101L)	7
Food Science and Technology 100A, 100AL, 100B, 100BL	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	16-19
Principles of economics (Economics 1A or 2A-2B) ..	5-7
Sociology or cultural anthropology	4
General psychology, Psychology 1	4
Principles of learning or methods of teaching (Applied Behavioral Sciences 173 or Education 110)	3-4

NOTE: For key to footnote symbols, see page 132.

Dramatic Art

Electives	48-61
Students wishing to complete an option in Dietetics should elect one of the series of courses indicated below.	
<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	5
<i>Community Nutrition</i> specialization, include the following courses:	
Nutrition 118, 118L, 119	7
Anthropology 2	4
Sociology 3, 130, 143	12
<i>Food Service Management</i> specialization, include Agricultural Economics 117, Economics 1B or 2C, 11A-11B, 150.	
Additional recommended courses are to be chosen according to the student's specific career goals: Epidemiology and Preventive Medicine 150; Food Science and Technology 1, 104, 104L, 107, 108 112; Consumer Science 100, 135; Plant Science 2; Viticulture and Enology 3; Applied Behavioral Sciences 151, 152; Work-Learn 192.	
Total Units for the Major	180

Major Adviser. F. J. Zeman (*Nutrition*).

Graduate Study. See page 101.

Dramatic Art

(College of Letters and Science)

Robert A. Fahrner, Ph.D., Chairperson of the Department
Department Office, 222 Dramatic Art Building

Faculty

Gene A. Chesley, M.A., Lecturer
Ruby Cohn, Ph.D., Professor (*Dramatic Art, Comparative Literature*)
Everard d'Hamoncourt, Ph.D., Professor
Robert A. Fahrner, Ph.D., Associate Professor
Jerry W. Helm, Lecturer
Harry C. Johnson, M.A., Assistant Professor
William E. Kleb, D.F.A., Assistant Professor
Phyllis J. Kress, M.F.A., Lecturer
Alfred Rossi, Ph.D., Associate Professor
Wendy Salkind, M.F.A., Lecturer
Robert K. Sarlos, Ph.D., Associate Professor
Theodore J. Shank, Ph.D., Professor
Daniel E. Snyder, Professor
Alan A. Stambusky, Ph.D., Professor

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.

Artists in Residence Program. The Department of Dramatic Art periodically engages professional artists-in-residence 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, 21B, 24, 25	18
Additional lower division units in Dramatic Art	4
Depth Subject Matter	39
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

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 107 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 from the Graduate Adviser.

COURSES IN DRAMATIC ART

Lower Division Courses

10. Introduction to Acting (3) I, II, III. Salkind
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'Hamoncourt
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.

20. Introduction to Dramatic Art (4) I, II. 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. Salkind
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. Salkind
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. The Staff
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. Creative Collaboration in Playwriting and Directing (4) II. Kleb
Workshop—4 hours; reading of selected texts in the theory of directing and playwriting. Prerequisite: consent of instructor. Exercises in conceiving and developing theatre pieces with emphasis upon the creative collaboration of playwright and director.

30. Theatre Laboratory (1-5) I, II, III. The Staff
Prerequisite: course 25 or consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit up to a total of 8 units.

70. Performance and Criticism (4) II. Kleb
Lecture-seminar—3 hours. Contemporary relationships among theory, practice, and criticism of dramatic art. Field trips, readings, and discussions; practice in performance documentation, analysis, and critical writing.

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. Salkind
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. Chesley
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.

125. History of Scene Design and Staging Methods (4) II. Sarlos
Lecture—4 hours. Study of scenic developments from the Renaissance to the present.

126. Production Management (3) III. 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, 156, 157, 158, and senior standing 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) III. Sarlos
Lecture—4 hours. The history of the theatre from Colonial times to the present. Readings of selected plays.

***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.

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 theatre 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) I, 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, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit.

190. Senior Projects in Dramatic Art (4) II, III. Fahrner
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.

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 (1-4) I, II, III. The Staff (Chairperson in charge)
Lecture—1-4 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

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) I, II, III. The Staff
Laboratory—4 hours. 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, Sal-kind
Seminar—2 hours; laboratory—4 hours. 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. Rossi
Seminar—2 hours; laboratory—4 hours. Advanced acting problems relating to plays selected from the Renaissance to Romanticism.

221C. Special Problems in Advanced Acting (4) III. Rossi
Seminar—2 hours; laboratory—4 hours. Advanced acting problems in plays drawn from Romanticism to the present.

224A. Advanced Principles and Theories of Theatrical Design (4) I, Snyder
Seminar—3 hours. Selected problems in the visual and auditory aspects of theatrical production.

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.

228. Seminar in Directing Theory (4) I, Kleb
Seminar—3 hours. Development of directorial conceptions for contemporary productions of selected plays from the Greek to the present.

***229A. Special Problems in Directing** (5) I, Stambusky
Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. 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. Rossi
Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. Projects in directing scenes selected from plays from the Renaissance to the Romantic periods.

229C. Special Problems in Directing (5) III. Stambusky
Seminar—2 hours; laboratory—2 hours; rehearsal—4

hours. The direction of a full-length play from a classical period.

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) I, d'Hamoncourt
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.

259. Contemporary Theatre (4) II. Cohn
Seminar—3 hours. World theatre since 1940, with emphasis on the relationship of the dramas of our period to the physical circumstances under which they are produced.

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.

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.

298. Group Study (1-4) I, II, III. The Staff (Chairperson in charge)
Seminar—1-4 hours. Prerequisite: consent of instructor.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Dissertation Research (1-6) 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. Lectures, demonstrations, and practical work in aspects of theatrical make-up.

421. Dance for Actors (2) I, J. H. Curry
Lecture-laboratory—1½ hours. Prerequisite: consent of instructor. Principles of choreography and dance for the stage performer.

East Asian Studies

(College of Letters and Science)

Program Office, 371 Voorhies Hall

Committee in Charge

Don C. Price, Ph.D. (*History*), Committee Chairperson

Gary G. Hamilton, Ph.D. (*Sociology*)

Key H. Kim, Ph.D. (*Oriental Languages*)

Marian B. Ury, Ph.D. (*Comparative Literature; Religious Studies*)

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.

Each student is required to develop a special field (e.g., anthropology, history, oriental languages) within the major, to be chosen in consultation with his or her 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	42
History 9A, 9B	8
One course from Political Science 9C, History 90A, 90B	4
Two years (or the equivalent) of Chinese or Japanese language study	30
Depth Subject Matter	36
History 192B-192C or 194A-194B	8
Political Science 148A, 148B	8
Anthropology 190 or 191	4
At least 16 units from the following:	16
Agricultural Economics 125; Anthropology 109, 110, 111, 112, 120, 122, 123, 124, 128, 162, 165, 190, 191, 192; Comparative Literature 170A, 170B, 170C, 170D; Economics 115A, 115B, 116; Geography 143; History 102G, 102H, 102N, 191A, 191B, 192A, 192B, 192C, 194A, 194B; Oriental Languages 100, 101, 111, 121, Political Science 132, 137, 142, 145, 148A, 148B; Religious Studies 170, 172; Sociology 118, 141, 147, 170. Other appropriate courses as approved by the Committee in charge	
Total Units for the Major	78

Recommended

Students are strongly urged to take a substantial number of courses in Euro-American civilization as a basis for comparison for a deeper understanding of American's relations with East Asia.

Major Advisers. J. K. Kallgren (Political Science), China; _____, Japan.

Ecology (A Graduate Group)

R. Merton Love, Ph.D., Chairperson of the Group
Group Office, 258 Hunt Hall

Graduate Study. The Graduate Group in Ecology offers the M.S. and Ph.D. degrees in three broad areas of study: (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 any 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 normally be expected to have completed a one-year sequence in basic biology, in elementary chemistry, 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:

a. Biological Ecology courses. Environmental Studies 100 (General Ecology), Zoology 125 (Animal Ecology), Entomology 104 (Insect Ecology), or Botany 117 (Plant Ecology).

b. Human Ecology courses. Environmental Studies 101 (Principles of Human Ecology), Environmental Studies 141 (Cultural Ecology), Anthropology 141 (Ecological Anthropology), or Geography 170 (Cultural Ecology).

c. Physical and Chemical Ecology courses. Environmental Studies 110 (Principles of Environmental Science), Environmental Studies/Geology 150A (Physical and Chemical Oceanography), or Atmospheric Science 123 (Micrometeorology).

Graduate Adviser. R. M. Love.

Faculty. The Group includes faculty from 36 departments in five schools and colleges.

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, Major, Valentine

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. (Same course as Botany 201, Geology 201, and Zoology 201.)

210. Advanced Topics in Human Ecology (4) II. Orlove
Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing. This 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) III. Orlove
Lecture—3 hours. Prerequisite: graduate standing. This course will discuss and evaluate 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.

212. Environmental Policy Analysis (4) III. Sabatier, Schwartz

Lecture—4 hours. Prerequisite: Economics 1A; Political Science 107; Environmental Studies 160 (or the equivalent); administrative policy-making (e.g., Environmental Studies 166, Political Science 180, 182, 183); resource economics or policy analysis (e.g., Agricultural Economics 147; one course from Environmental Studies 168A, 168B; Political Science 109A, 109B; graduate standing. A survey of decision-making theory, focusing on the development of formal evaluative techniques and their limitations within the total political process. The course deals primarily with the implementation of environmental policy rather than its general formulation. Offered in odd-numbered years.

213. Advanced Demography (4) III. Cramer

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 emphases on methods of analysis and on contemporary societies. Offered in even-numbered years.

220. Transport Processes in the Biosphere (3) II. Myrup

Lecture—2 hours; discussion—1 hour. Prerequisite: undergraduate training in integral and differential calculus, college physics and general biology; graduate standing. 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.

230. Analysis of a Selected Ecosystem (4) I. Delwiche

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. 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. Topics in biological, human, physical, and chemical ecology. (SU 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. (Section 1, letter grading; all other sections, SU 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
 Richard R. Cornwall, Ph.D., Associate Professor
 Bruce Glassburner, Ph.D., Professor
 Victor P. Goldberg, Ph.D., Associate Professor
 W. Eric Gustafson, Ph.D., Lecturer
¹Hiroimitsu Kaneda, Ph.D., Professor
²Thomas Mayer, Ph.D., Professor
 William G. Moss, Ph.D., Assistant Professor
 Alan L. Olmstead, Ph.D., Associate Professor
 Martin P. Oettinger, Ph.D., Associate Professor
 John E. Roemer, Ph.D., Assistant Professor
 Linda Shaffer, M.A., Acting Assistant Professor
 Steven Sheffrin, Ph.D., Assistant Professor
¹Tsung-yuen Shen, Ph.D., Professor
 Ross M. Starr, Ph.D., Associate Professor
 Elias H. Tuma, Ph.D., Professor
 Leon 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 or 2A-2B-2C	10
Economics 12	5
<i>At least a C average in the above courses.</i>	
Depth Subject Matter	36
Economics 100, 101	10
One course from Economics 110A, 110B, 111	4
One course sequence from the Following:	
Economics 110A-110B; 110A-111 or	
110B-111, 115A-115B; 116-117; 121A-121B;	
125A-125B; 130-131, 135A-135B-135C;	
150-151; 150-152, 160-161.	
Additional economics courses to achieve a	
minimum of 36 upper division units	12-14

NOTE: For key to footnote symbols, see page 132.

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.

Major Advisers. A. Brzeski, R. R. Cornwall, W. E. Gustafson, M. P. Oettinger, J. E. Roemer, R. M. Starr.

American History and Institutions. This University requirement can be satisfied by completion of Economics 111. (See also page 60.)

Teaching Credential Subject Representative. A. Brzeski. See page 107 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).

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. B. Glassburner, W. G. Moss, 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.

***2A-2B-2C. Principles of Economics** (4-3-3) I, II, III. Gustafson
 Lecture—3-2-2 hours; discussion—1-1-1 hour. Same as Economics 1A and 1B. Students enrolling for a full year of Principles of Economics must complete either 1A-1B or 2A-2B-2C.

11A. Elementary Accounting (4) I.

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 sequence.)

11B. Elementary Accounting (3) II.

Lecture—2 hours; laboratory—2 hours. Prerequisite: course 11A. Continuation of course 11A. (Deferred grading only, pending completion of sequence.)

12. Introduction to Quantitative Methods in Economics

(5) I, Brzeski; III, Gustafson
 Lecture—4 hours; laboratory—2 hours. Prerequisite: two years of high school algebra. Not open to students having credit for Mathematics 13, Psychology 3 or Sociology 46. 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.

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.)

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 or 2A-2B-2C or consent of instructor. Price and distribution theory under condition of perfect and imperfect competition. Welfare economics.

101. Intermediate Macro Theory (5) I, II, III. The Staff Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Theory of income, employment and prices under static and dynamic conditions.

102. Advanced Macro Theory (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 12, 101; Mathematics 16A-16B or consent of instructor. Selected topics in macroeconomic theory.

103. Theory of Economic Optimization (4) I, Roemer

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100, 101; 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 Agricultural Economics 103.)

105. History of Economic Thought (4) III. Shen

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C 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 2A-2B-2C 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 2A-2B-2C 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.

111. Economic History (4) III. Olmstead

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Survey of economic change in the United States beginning with the Colonial Period; reference to other regions of the Western Hemisphere; implications for contemporary economic problems.

115A-115B. Economic Development (4-4) I-II. Glassburner, Kaneda

Economics

Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C 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) I. Brzeski
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C 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) II. Brzeski
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C 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 and 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.

121A. Industrial Organization (4) II. Shen
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or course 100, 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.
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) III. Gustafson
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Economics and populations as self-regulating systems; economic regulation of man's interaction with his 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. Moss
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C 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 consent of instructor. Public expenditures: theory and applications. Efficiency and equity of competitive markets; externalities, public goods, and market failure; 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 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.
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C and course 11A. The corporation as a form of business organization; promotion, organization, operation, expansion, consolidation, failure, and reorganization; the capital market, financial instruments and institutions; security markets.

135A. Money, Income, and Monetary Policy (3) I.
Lecture—3 hours. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Monetary institutions, the banking system, money creation, the Federal Reserve System, the tools of monetary policy.

135B. Money, Income, and Monetary Policy (4) II.
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 101 and 135A. Monetary theory; the impact of changes in the quantity of money and of liquid assets on money income.

135C. Money, Income, and Monetary Policy (3) III.
Lecture—3 hours. Prerequisite: course 135B. Evaluation of monetary policy, its impact on the economy and past performance, and the problem of inflation.

150. Trade Unions and the Labor Market (4) II. Oettinger
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. Theory and philosophy of labor movements in America, Western Europe and the developing world. The structure and government of labor unions. Current labor market issues.

***151. Wage Determination (4) III.**
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 100 and 101 or consent of instructor. The theory and practice of wage determination on the micro and macro level. The impact of legal minimum wages. Wage-price and wage-employment relationships. Offered in odd-numbered years.

152. Labor and Public Policy (4) III. Oettinger
Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 150 or consent of instructor. The economic impact of labor legislation. Collective bargaining, strikes, dispute settlement and government intervention. Manpower and welfare programs. Offered in even-numbered years.

160. International Trade (4) I. Shen
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. International trade theory; impact of trade on the domestic and the world economies; public policy toward external trade.

161. International Finance (4) II. Shen
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or 2A-2B-2C or consent of instructor. International money and capital markets and their impact on the domestic and world economies; international financial institutions and policies.

***189. Field Work in Economics (5) III.**
Seminar—1 hour; 4 hours—working with a unit of state or local government or local agency. Prerequisite: upper division standing; consent of instructor. Applied economics: stresses research methods, empirical analysis, and the relevance of microeconomic theory for resolving government, labor, or business issues at the community or state level. Individual topics variable.

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—2 hours. 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 (4) I. French (Agricultural Economics)
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A or consent of instructor. Theory of the Firm under Perfect Competition; programming and dynamic models of the firm. (Same course as Agricultural Economics 200A.)

200B. Microeconomic Theory (4) II. Cornwall
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A and Mathematics 16B or consent of instructor. Static and dynamic consumer behavior, imperfect competition, market and multi-market equilibrium, introduction to welfare economics and externalities. (Same course as Agricultural Economics 200B.)

200C. Microeconomic Theory (4) III. Cornwall
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 103 and 200B. Linear economic systems, the static Leontief system, competitive general equilibrium, welfare economics, comparative statics, and risk. (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.

201. History of Economic Thought (4) III. Shen
Lecture—3 hours; to be arranged—1 hour. Development of economic thought from classical Greece to modern times.

***202. Topics in Economic Theory (4) I.** Wegge, Shen
Seminar—4 hours. Prerequisite: courses 200A-200E or consent of instructor. Recent developments in economic theory.

203A. Advanced Economic Theory (4) III. Cornwall
Seminar—4 hours. Prerequisite: course 200C. Advanced topics in the theory of the firm; distribution theory; welfare economics.

203B. Advanced Economic Theory (4) I. Starr
Seminar—4 hours. Prerequisite: courses 200C and 200E. General equilibrium theory; capital theory; growth theory.

204. Microeconomic Analysis (5) I. Moss
Lecture—4 hours; discussion—1 hour. Prerequisite: course 100 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.

207. Special Topics in Mathematical Economics (4) II. Cornwall
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-215B. Economic Development (4-4) I-II. Glassburner
Lecture—3 hours; to be arranged—1 hour. Theories of economic development, policies for growth, and problems from selected areas.

215C. Development Programming (4) III. Kaneda Seminar—4 hours. Prerequisite: courses 200B, 200E, 215B; consent of instructor. Analysis of development plans, programs, and policies; application of input-output, programming, and operations research methods to development planning.

216. Economic Systems (4) I, 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.

221A. Industrial Organization (4) II. Goldberg
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.

225. Urban Economics (4) II Moss
Lecture-discussion—4 hours. Prerequisite: course 200A. Application of economic theory and quantitative methods to the urban economy: structure, growth, and problems.

***230A. Public Finance** (4) I.
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.
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. Mayer
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.
Lecture—4 hours; term paper. Prerequisite: Mathematics 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, Wegge
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A; Mathematics 131A, 131B-131C recommended. Multivariate analysis, specification analysis, simultaneous equation models, identification, estimating methods, small sample properties. (Same course as Agricultural Economics 240B.)

240C. Advanced Econometrics: Applications (3) II.
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) II. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 150 and 151 or the equivalent. Philosophy, theory and history of American and foreign labor movements; union structure and organization under changing labor market conditions; human resources, manpower policy and other labor market issues.

250B. Labor Economics (4) III.
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 150 and 151. Theory of the labor market; analysis of wage-employment, wage-investment, and wage-price relationships.

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.

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.)

Education

(College of Letters and Science)

Julius M. Sassenrath, Ph.D., Chairperson of the Department

Douglas L. Minnis, Ed.D., Head of Teacher Education

David R. Wampler, Ph.D., Associate Head of Teacher Education

Department Office, 174 Kerr Hall

Faculty

Donald G. Amstine, Ph.D., Professor

Helen G. Bacon, Ed.D., Lecturer in and Supervisor of Teacher Education

Hugh C. Black, Ph.D., Professor

^{3,4}Vincent A. Crockenberg, Ph.D., Assistant Professor

W. Augustus Davis, M.Ed., Lecturer in and Supervisor of Teacher Education

Linnea C. Ehri, Ph.D., Associate Professor

Larry D. Estes, M.A., Lecturer in and Supervisor of Teacher Education

Richard A. Figueroa, Ph.D., Assistant Professor

Jane Garritson, M.A., Lecturer in and Supervisor of Teacher Education

Maryann E. Gatheral, B.A., Lecturer in and Supervisor of Teacher Education

Robert E. Hapworth, M.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

Walter T. Mara, M.S., Lecturer in and Supervisor of Teacher Education

Douglas L. Minnis, Ed.D., Senior Lecturer

Susan A. Ostergard, M.A., Lecturer in and Supervisor of Teacher Education

Victor A. Perkes, Ed.D., Lecturer in and Supervisor of Teacher Education

²Jonathan H. Sandoval, Ph.D., Assistant Professor

Julius M. Sassenrath, Ph.D., Professor

²S. Joan Skinner, M.A., Lecturer in and Supervisor of Teacher Education

^{3,4}Carlton J. Spring, Jr., Ph.D., Associate Professor

²Leroy F. Troutner, Ph.D., Associate Professor

George D. Yonge, Ph.D., Professor

David R. Wampler, Ph.D., Lecturer in and Supervisor of Teacher Education

Currricula for Teacher Education

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 107.)

Credentials Counselors: Multiple Subject. H. G. Bacon, J. Garritson, M. E. Gatheral, R. E. Hapworth, S. A. Ostergard, S. J. Skinner, D. R. Wampler.

Credentials Counselors: Single Subject. W. A. Davis, L. D. Estes, B. Liebert, J. E. Lowry, W. T. Mara, V. A. Perkes.

COURSES IN EDUCATION

Upper Division Courses

100. Field Experience in Education (2) I, II, III. The Staff
Discussion—1 hour; field work—3 hours (in schools and care centers). Prerequisite: upper division standing. Course designed to provide faculty assistance to students who work as tutors or teachers aides. Limited enrollment. May be repeated only once for credit. (P/NP grading only.)

110. Introduction to Educational Psychology (4) I, II, III. Ehri, Figueroa, Sandoval, Sassenrath, Spring, Yonge
Lecture—4 hours. Prerequisite: upper division or graduate standing; Psychology 1. The learning process; physical, mental, and social development; individual differences and their measurement; mental hygiene; the role of the teacher in guidance and counseling.

114. Quantitative Methods in Educational Research (4) I, III. Yonge
Lecture—2 hours; discussion—2 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.

Education

116. Chicano Children: Psychological Issues (4) III. Figueroa
Lecture—2 hours; discussion—2 hours. Prerequisite: courses 110 and 120. 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, Spring
Lecture—2 hours; discussion—1 hour. Prerequisite: Psychology 1 or the equivalent; upper division or graduate 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—2 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.

120. Philosophical and Social Foundations of Education (4) I, II, III. Amstine, Black, Troutner
Lecture—4 hours. Prerequisite: upper division or graduate standing. Philosophical, historical, and sociological study of education and the school in our society.

122. The Politics of the Schools (4) I, Crockenberg
Lecture—4 hours. Prerequisite: upper division or graduate 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, Amstine
Lecture—4 hours. Prerequisite: upper division or graduate 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.

150A. Educating and Tutoring Minority Children and Youth (2) I, Davis
Lecture—1 hour; field work—3 hours. Poverty as it affects a person's performance in the school with emphasis on how to deal with it in the school and community. (P/NP grading only.)

150B. Educating and Tutoring Minority Children and Youth (2) II, Davis
Lecture—1 hour; field work—3 hours. Racism as it affects a person's performance in the school with emphasis on how to deal with it in the school and community. (P/NP grading only.)

150C. Educating and Tutoring Minority Children and Youth (2) III, Davis
Lecture—1 hour; field work—3 hours. Youth cultures as they affect a person's performance in the school with emphasis on how to deal with them in the school and community. (P/NP grading only.)

151. Language Problems of the Mexican-American Child (4) I.
Lecture—3 hours; field work—2 hours. Prerequisite: upper division standing. Problems of phonology, syntax, and lexicon encountered by the Mexican-American child in English-speaking public school systems.

163. Guidance and Counseling (4) I, II, III. 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, III. 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.)

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

201. History and Philosophy of Education: Ancient Period (4) I, Black

Lecture—2 hours; seminar—2 hours. Prerequisite: consent of instructor. Scope, influence, and significance of the major educational ideas from selected ancient societies and cultures with emphasis upon the historical and philosophical contexts.

203. Twentieth-Century Issues Over the Schools (4) III, 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) II, 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) III, Amstine
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.

***206. Social Theory and the American School** (3) II, Amstine, Crockenberg
Seminar—3 hours. Prerequisite: consent of instructor. A study of social institutions from the perspective of modern social theories: Weber, Durkheim, Marx, Dewey, Sorokin, Pareto, Parsons, and others. Focus on social change and the role of educational institutions in promoting or hindering change.

207. Concepts of the Curriculum (3) II, Amstine
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.

210. Cognitive Learning (3) I, Sassenrath
Seminar—3 hours. Prerequisite: consent of instructor. A critical analysis of selected problems and procedures in the study of cognitive learning processes.

211. Thinking and Problem Solving (4) II, Yonge
Seminar—4 hours. Prerequisite: consent of instructor. Critical consideration of thinking with special reference to conceptual behavior, problem solving, creativity, home, school, and personality influences.

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.

213A. 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. Offered in even-numbered years.

213B. Individual Assessment (3) II, Figueroa
Lecture—3 hours. Prerequisite: course 213A, admission to school psychology program. Theories of affective functioning in school-aged children including adaptive behavior, personality development and interpersonal competence. Supervised appraisal of the child, integrating the methods

of observation, mental testing and interviewing. Offered in odd-numbered years.

***215. Social Learning** (3) II, Spring
Seminar—3 hours. Prerequisite: consent of instructor. Theory and research on behavior modification; analyses of modeling, reinforcement, punishment, and extinction; implications for education.

219. Educational Testing, Evaluation, and Differences (3) III, Sassenrath

Seminar—3 hours. Prerequisite: course 114 or consent of instructor. A study of test theory as it applies to research, evaluation, and human differences in education.

270A. Reading Diagnosis and Prescription (3) I, Bacon, 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

Seminar—3 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) II, 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) III, 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.

273. Modern Mathematics Curricula (4) III, Mara, Ostergard
Lecture—3 hours; laboratory—2 hours. Prerequisite: consent of instructor. Survey of modern mathematics curricula; analyzing goals, defining objectives, and structuring content of a mathematics program; design and use of manipulative materials and media to promote mathematical insight and discovery; evaluating curriculum effectiveness.

274. Analysis of Teacher Behavior (2) II, Minnis
Seminar—2 hours. Prerequisite: teaching credential and consent of instructor. Study of major systems used to describe classroom behavior of pupils and teachers. Design of new systems to describe behavior in special classroom situations. Use of descriptive systems in developing teaching strategies.

276. Instructional Strategies (2) III, Minnis
Seminar—2 hours. Prerequisite: consent of instructor. Analysis of instructional variables as they relate to diverse types of teaching strategies. Problems in instructional decision-making.

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, II, III. Bacon, Gatheral, Skinner

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) II, III. Garrison
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
Lecture-Seminar—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: acceptance into a Teacher Education Program. Supervised teaching 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
Lecture-Seminar—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 304A. Supervised teaching 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
Lecture-Seminar—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 304B. Supervised teaching 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
Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: acceptance into a Teacher Education Program. Supervised teaching in the 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
Lecture—3 hours; discussion—2 hours; student teaching—15-30 hours. Prerequisite: course 305A. Supervised teaching 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
Lecture—3 hours; discussion—2 hours; student teaching 15-30 hours. Prerequisite: course 305B. Supervised teaching in a departmentalized junior high school. Current conceptions of the junior high school with emphasis on effective teaching methods, and selection of curriculum materials. Alternative programs.

306A. Introduction to Secondary Education (3) I, II, III, The Staff
Lecture—1 hour; discussion—1 hour; field work—2 hours. Prerequisite: acceptance into a Teacher Education Program. Skills and techniques for developing and analyzing

classroom communications; identifying and constructing goals and objectives of instruction; assessment of learning; special problems of adolescents; audio-visual materials and techniques.

306B. Teaching in Secondary Schools (6-12) I, II, III, The Staff
Student teaching plus conferences with supervisor—18-36 hours per week. Prerequisite: course 306A (may be taken concurrently). Supervised teaching in secondary and departmentalized schools. Undergraduates must repeat for a total of 15 units; graduates must repeat for a total of 18 units. (Deferred grading only, pending completion of course at end of public school session.)

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.

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. (Deferred grading only, pending completion of course at end of public school session.)

323. Secondary School Curriculum: Science (3) I, Perkes
Lecture—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. (Deferred grading only, pending completion of course at end of public school session.)

324A-324B-324C. Teaching Methods in Mathematics (1-1-1) I, II, III, Mara
Lecture—1 hour. Prerequisite: admission to a teacher education program, simultaneous teaching experience and a strong mathematics background; or consent of instructor. Instructional styles for teaching mathematics; curriculum materials and their appropriate use; learning objectives and design of effective mathematics programs.

340. Supervised Teaching in Junior Colleges (5) I, II, III, Mara
Discussion—1 hour; supervised teaching—minimum 45 clock hours. Prerequisite: consent of instructor. Directed teaching for candidates for the standard teaching credential with specialization in junior college teaching. (S/U grading only.)

341. Teaching in the College and University (2) I, Minnis
Lecture—2 hours; laboratory—1 hour. Prerequisite: graduate or faculty standing and consent of instructor. Analysis of course aims and objectives. Teaching techniques for college-level instruction with emphasis on lecture and discussion. Evaluation of instruction and student performance. Designed for teaching assistants and graduate students. Taught by a team of faculty from a variety of disciplines.

361A-361B-361C. School Psychology: Introduction (2-2-2) I, II, III, Sandoval, Figueroa
Seminar—2 hours; field work—one 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 excep-

^aStudents must make their own transportation arrangements for observations and student teaching.

^bOpen only to interns and student teachers. These 300 series courses are scheduled as extra-session courses, to begin with the opening of the public schools and to end with the closing of the second semester in the public schools. Thus teaching assignments in the Fall Quarter, 1976, will begin on or about September 2. For the Spring Quarter, 1977, they will end on or about June 2. Students should make arrangements accordingly.

tional children in the school. Sequence must be repeated once during second graduate year. Fieldwork in the school and other institutions serving children.

362. School Psychology: Internship (4-8) I, II, III, Sandoval, Figueroa
Internship—6-18 hours; seminar—2 hours. Individual assessment and program evaluation, mental health consultation, intervention strategies to promote the school learning and adjustment of children. Must be repeated twice for credit.

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.

370B. Advanced Fieldwork in Reading: Secondary (2) II, 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.

370C. Fieldwork in Reading Supervision (2) III, 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.

Education Abroad Program

Hendrik J. Ketellapper, Ph.D., Campus Coordinator

Campus Coordinator's Office, 150 Mrak Hall
(752-0392)

EAP 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 44) 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

Education Abroad Program

EAP should contact the EAP Office or the Coordinator's Office early in the fall quarter concerning the deadlines for application. This is important, because application deadlines for some centers, including the United Kingdom, Ireland, Africa, Asia, and Israel, are as early as late October.

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 44) should consult the Campus Coordinator. Students who will have accumulated more than 145 units prior to the beginning of their planned year of study abroad should also consult the Campus Coordinator before submitting an application; the probability of such students being accepted is rather low.

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, Kenya, Hong Kong, and Japan); (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.

Units and grade points earned in the EAP are incorporated into the UC transcript and GPA. Course work completed in the EAP does not satisfy the residence requirement for the degree, however. Prospective participants, especially those planning to spend the senior year abroad, should consult the Dean of their College concerning satisfaction of the residence requirement. Although units and grade points are accepted, the major department or program retains the right to determine which of the courses may be accepted in satisfaction of unit or course requirements in the major.

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

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 is well known.

University of Grenoble. Mainly in the social sciences through the Université des Sciences Sociales (Grenoble II). Some humanities and physical sciences.

University of Marseilles. Biological sciences and environmental marine biology.

University of Montpellier. Humanities, primarily through Paul Valéry University.

University of Paris. Film studies and some theatre studies.

University of Pau (Pau Paris). 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.

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. Space in laboratory courses in biology and psychology is severely limited.

Eberhart Karl University, Tübingen. An 8-week summer program in German Language for graduate students only.

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.

University of Padua. History of Art (including archeology), Italian Literature (including linguistics), and Political Science (which includes history, social sciences, geography, and demography, as well as political science in the American sense).

Conservatorio di Musica C.B. Martini, Bologna. Individual instruction in music performance; composition; music history.

Accademia delle Belle Arti di Venezia, Venice. Art studio and some art history.

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, and natural sciences and mathematics are available, but space in the sciences may be limited. The usual pattern is study for 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. (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.

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.

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. Once accepted, 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, Westfield College of the University of London, University of Reading, University of Sussex, University of Warwick, Polytechnic of Central London, 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; and the University of Reading has strong programs in agriculture and horticulture; 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 univer-

sity 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, 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.

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 opportunity in the sciences. Special program in Underwater Archeology.

Hebrew University, Jerusalem. Broad curriculum; emphasis on Israel and Middle Eastern Studies.

UC students enroll in a special program for foreign students, taught in English. Students with command of Hebrew have access to a much broader curriculum throughout the university, including the sciences. Laboratory space is scarce, however, and departmental permission is required to take science courses.

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, or a number of units sufficient to raise the overall total to 18 units.

Chinese University, Hong Kong. Humanities and social sciences, with emphasis on Chinese studies. (Information about courses to be offered in English is announced only one week before instruction begins.)

A special two-year program, including at least one year of graduate study, is available to students pursuing graduate degrees in Chinese studies and related fields.

Japan. Completion of one year of Japanese at the university level or the equivalent is required for acceptance. Students are expected to complete an additional 18 units of Japanese language during their year in Japan. 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.

Africa

Ghana. 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.

University of Ghana, Legon-Accra. Humanities and social sciences, with emphasis on African studies. No sciences available.

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.

Latin America

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.

National Autonomous University of 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.

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
Warren H. Giedt, Ph.D., Associate
Dean—Graduate Study
Ray B. Krone, Ph.D., Associate Dean—Research
College Office, 2132 Bainer Hall

Faculty

G. Worden Waring, Ph.D., Professor, (School of
Medicine)

Curricula and Courses

See pages 76-85 for general descriptions of the areas of engineering and for lists of suggested technical electives; and page 75 for lists of acceptable Basic Science and Mathematics electives and acceptable Humanities-Social Services electives.

Students who enter the College of Engineering with less than 84 quarter units of credit follow one

of the two common Lower Division Programs listed below. One program is for students who plan to major in Chemical Engineering or in the double major in Chemical Engineering and Materials Science and Engineering. The other program is for students in the other Engineering majors. The Lower Division Program for students who enter the College of Engineering with 84 or more quarter units of credit is listed under "Admission to Advanced Undergraduate Standing," on page 72.

Engineering—Lower Division Program

Requirements Common to all Engineering Majors (except Chemical Engineering and the Double Major in Chemical Engineering/Materials Science and Engineering)

Required Courses	UNITS	QUARTER USUALLY TAKEN
Mathematics 21A-21B-21C, calculus	12	1-2-3
Mathematics 22B, differential equations	3	5
Mathematics 22C, vector analysis	3	4
Physics 4A-4C-4E, general physics	12	2-4-6
Chemistry 1A-1B or 4A-4B, general chemistry	10	4-5
Engineering 3, introduction to en- gineering systems	3	1 or 3
(Engineering 3 is designed for freshman students; more ad- vanced students may petition to substitute 3 units of technical electives for Engineering 3)		
Engineering 4, engineering graphics in design	3	1 or 2
(Electrical Engineering majors may substitute 3 units of unre- stricted electives for Engineering 4)		
Engineering 5, applications of computers	3	2 or 3
Engineering 17, circuits	3	5 or 6
Engineering 35, statics	3	4 or 5
Engineering 45, properties of materials	4	4 or 6
English 1, expository writing	4	1 or 2
Rhetoric 1 or 3, introduction to pub- lic speaking or group communication	4	
Humanities-Social Sciences Electives	8	
Basic Science and Mathematics Electives	12	
Unrestricted Electives	3	
(Civil Engineering majors and Ag- ricultural 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 Chemical Engineering and the Double Major in Chemical Engineering/Materials Science and Engineering Majors Only

Required Courses	UNITS	QUARTER USUALLY TAKEN
Mathematics 21A-21B-21C, calculus	12	1-2-3

NOTE: For key to footnote symbols, see page 132.

Engineering

Mathematics 22A, linear algebra ..	3	6	
Mathematics 22B, differential equations	3	5	
Mathematics 22C, vector analysis ..	3	4	
Physics 4A-4B-4C-4D-4E, general physics	20	2-3-4-5-6	
Chemistry 4A-4B-4C, general chemistry	15	1-2-3	
Chemistry 128A, organic chemistry	3	6	
Chemistry 129A, organic chemistry laboratory	2	6	
Engineering 3 or 45, introduction to engineering systems or properties of materials	3-4		
(Chemical Engineering majors take Engineering 3; Chemical Engineering/Materials Science and Engineering majors take Engineering 45. Engineering 3 is designed for freshmen students; more advanced Chemical Engineering students may petition to substitute Engineering 45 or 3 units of technical electives for Engineering 3.)			
Engineering 5, engineering applications of computers	3	5	
Engineering 17, circuits	3	5	
Engineering 35, statics	3	4	
English 1, expository writing	4	2 or 3	
Rhetoric 1 or 3, introduction to public speaking or group communication	4		
Humanities-Social Sciences Electives	11		
Total Units		92 or 93	

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

The Major Programs

Aeronautical Engineering

B.S. Major Requirements:

Minimum units required: 180.

Subject Areas		UNITS
Electronic circuits; Engineering 100	4	
Applied mechanics; Engineering 102A, 102B, 104A	9	
Fluid mechanics; Engineering 103A, 103B	6	
Applied thermodynamics; Engineering 105A, 105B	6	
Vehicle aerodynamics; Mechanical Engineering 127	3	
Systems; Mechanical Engineering 171	4	
Structures; Engineering 104B, Civil Engineering 135	6	
Vehicle stability; Mechanical Engineering 134	4	
Vehicle design; Mechanical Engineering 128A, 128B	4	
Measurements and laboratory; Engineering 102L, 103L, 105L, Mechanical Engineering 124, 176	8	
Mathematics; Engineering 180	3	
Humanities—Social Sciences Electives	15	
Technical Electives	16	
Choose at least 12 of the 16 units from the following: Mechanical Engineering 121, 161, 162, 165, 166, 172; Engineering 106, 148, 190; Civil Engineering 131B; Electrical Engineering 150.		

Only six units of 199 courses may be used to satisfy the technical elective requirement for the Aeronautical Engineering curriculum.

Unrestricted Elective	2
Total Units	90

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study. See pages 85 and 101.

Agricultural Engineering

B.S. Major Requirements:

(Accredited by Engineers' Council for Professional Development).

Minimum units required General Agricultural Engineering (not Forest Engineering) 180. Forest Engineering Option. 195.

Requirements Common to Agricultural Engineering Programs	UNITS
Subject Areas	
Applied mechanics, Engineering 102A, 103A, 104A (or Mechanical Engineering 104A and Civil Engineering 165A, 130, respectively, (Berkeley campus)	9
Applied mathematics, 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 150	5
Engineering economics, Engineering 106	3
Professional responsibilities, Engineering 190	3
Humanities-Social Sciences Electives	15
Unrestricted Electives	4
Total Units	46

Additional Requirements for General Agricultural Engineering (except Forest Engineering)

Subject Areas	
Applied Mechanics and thermodynamics, two courses from Engineering 102B, 103B (or Civil Engineering 141), 104B, 105B	6

Technical Electives

Agricultural engineering	15
Select from Agricultural Engineering 112, 114, 115, 117, 118, 119, 125, 132; Food Science and Technology 150; Water Science 110A, 110B, 141, 160. Must include one course from each of three of the four following sets (a) Agricultural Engineering 125, (b) Agricultural Engineering 132, (c) Agricultural Engineering 112 or 114 and (d) Water Science 110A or 110B	6
Agricultural and biological sciences	6
Select from Agronomy 100, Animal Science 2, Bacteriology 2, Biochemistry 101A, 101B, Biological Sciences 1; Botany 2; Entomology 112; Nutrition 103; Physiology 100A, 100B, 149; Plant Pathology 120; Plant Science 2, 112, 120; Soil Science 2, 107; Vegetable Crops 100, 101; Wildlife and Fisheries Biology 120. Must include one upper division course.	6
Additional Technical Electives	17
At least 8 units must be upper division engineering courses.	

Total Units 90

Additional Requirements for Forest Engineering Option

Subject Areas

Forestry summer field study, Forestry 100A, 100B, 100C (Berkeley campus)	15
Forest Engineering Forestry 103 (Berkeley campus) Agricultural Engineering 115	6
Forestry, Forestry 113, 125 (Berkeley campus)	9

Technical Electives

Forestry	12
One course from Forestry 110A, 110B, 114, three courses from Forestry 101, 102, 120, 122, and Wood Science and Technology 132 (Berkeley campus)	
Engineering	11
Select from Agricultural Engineering 112, 117, 118, 119, Civil Engineering 171, Engineering 102B, 103B, 104B, 111, 122, 140, Mechanical Engineering 121, 152, 155.	
Additional Technical Electives	6
Total Units	105

Agricultural Engineering/Materials Science and Engineering

B.S. Major Requirements:

Minimum units required: 180.

Subject Areas	UNITS
Applied mechanics, Engineering 102A, 103A, 104A, 104B; Engineering 102B or 103B	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 150	5
Engineering economics, Engineering 106	3
Materials Science, Engineering 140, 148; select two from Engineering 142, 144, 145	14
Applied mathematics, Engineering 180	3
Professional responsibilities, Engineering 190	3

Technical Electives

Agricultural engineering	15
Select from Agricultural Engineering 112, 114, 115, 117, 118, 119, 125, 132; Food Science and Technology 150; Water Science 110A, 110B, 141, 160. Must include one course from each of three of the four following sets: (a) Agricultural Engineering 125, (b) Agricultural Engineering 132, (c) Agricultural Engineering 112 or 114, and (d) Water Science 110A or 110B.	
Agricultural and biological sciences	6
Select from Agronomy 100; Animal Science 2; Bacteriology 2; Biochemistry 101A, 101B; Biological Sciences 1; Botany 2; Entomology 112; Nutrition 103; Physiology 100A, 100B, 149; Plant Pathology 120; Plant Science 2, 112, 120; Soil Science 2, 107; Vegetable Crops 100, 101; Wildlife and Fisheries Biology 120. Must include one upper division course.	

Humanities-Social Sciences Electives

Total Units 90

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study. See pages 85 and 101.

Chemical Engineering**B.S. Major Requirements:**

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 183.

	UNITS
Engineering, Engineering 100, 102A	7
Chemical Engineering, Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 158	42
Chemistry, Chemistry 110A, 110B, 110C, 128B	12
Humanities-Social Sciences Electives	12
Technical Electives	18
Total Units	91

Chemical Engineering/Materials Science and Engineering**B.S. Major Requirements:**

Minimum units required: 188.

	UNITS
Engineering, Engineering 100, 102A	7
Chemical engineering, Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 158	42
Chemistry, Chemistry 110A, 110B, 110C, 128B	12
Materials science, Engineering 130, 140, 142, 144, 145, 148	22
Humanities-Social Sciences Electives	12
Total Units	95

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study. See pages 85 and 101.

Civil Engineering**B.S. Major Requirements:**

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 180.

	UNITS
Electronic circuits, Engineering 100	4
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; Civil Engineering 132A or 145 or 148B or 162	6
Economics, Engineering 106 or Agricultural Economics 148	3
Mathematics electives, Select from Mathematics 22A, 24, 128A, 128B, 128C, 130A, 130B, 131A, 131B; Applied Science 115; Engineering 180 or Electrical Engineering 118	5
Technical electives 12 units must be selected from Engineering courses.	20

NOTE: For key to footnote symbols, see page 132.

Humanities-Social Sciences Electives	15
Unrestricted Electives Transfer students not having credit for Civil Engineering 10 (or the equivalent) must take it in place of 3 units of unrestricted electives.	4
Total Units	90

Civil Engineering/Materials Science and Engineering**B.S. Major Requirements:**

Minimum units required: 180.

	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
Civil engineering design, Civil Engineering 132B, 132A or 145 or 148B or 162	6
Economics, Engineering 106 or Agricultural Economics 148	3
Mathematics electives, selected from Mathematics 22A, 24, 128A, 128B, 128C, 130A, 130B, 131A, 131B; Applied Science 115 or Engineering 180	5
Materials science electives, choose four courses from Engineering 140, 142, 144, 145, 148	14
Humanities-Social Sciences Electives	15
Technical Electives Civil Engineering 137 recommended.	6
Total Units	90

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study. See pages 85 and 101.

Electrical Engineering**B.S. Major Requirements:**

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 180.

	UNITS
Requirements Common to Electrical Engineering Programs	
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
Mathematics or physics elective, an upper division mathematics or physics course	3
Engineering science, Engineering 102A, 105A	6
Laboratory elective, one course with a laboratory (including Electrical Engineering 199) taken after Engineering 100	3
Total Units	18

Additional Requirements for General Electrical Engineering (except Computer Science)

	UNITS
Subject Areas Circuits, systems, and electronics; Engineering 100; Electrical Engineering 112A, 112B, 110A, 110B, 111A, 111B	20

Fields and physical electronics; Electrical Engineering 130A, 130B, 140A, 140B	12
Technical Electives	23
Humanities-Social Sciences Electives	15
Unrestricted Electives	2
Total Units	90

Additional Requirements for Computer Science Option**Subject Areas**

Circuits, systems, and electronics; Engineering 100; Electrical Engineering 112A, 112B, 110A, 110B, 111A	18
Fields and physical electronics; Electrical Engineering 130A, 140A, 140B	9
Computer science; Electrical Engineering 170, 174, 177	9
Computer science electives, select two courses from Electrical Engineering 173, 175, 176, 178, 270-279; Human Physiology 151, 252	6
Technical Electives	13
Humanities-Social Sciences Electives	15
Unrestricted Electives	2
Total Units	90

Electrical Engineering/Materials Science and Engineering**B.S. Major Requirements:**

Minimum units required: 181.

	UNITS
Subject Areas 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
Mathematics or physics elective, an upper division mathematics or physics course	3
Engineering science, Engineering 102A, 105A, 130	10
Laboratory elective, Electrical Engineering courses with a total of 2 units of laboratory in physical electronics area	2
Circuits, systems, and electronics; Engineering 100, Electrical Engineering 112A, 112B, 110A, 110B, 111A, 111B	20
Fields and physical electronics, Electrical Engineering 130A, 130B, 140A, 140B	12
Solid-state electronics, Electrical Engineering 145A, 145B, 145C	9
Materials science; Engineering 142, 148; and two courses chosen from Engineering 140, 144, 145	14
Humanities-Social Sciences Electives	15
Total Units	91

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study. See pages 85 and 101.

Materials Science and Engineering**B.S. Major Requirements:**

Minimum units required: 180.

	UNITS
Subject Areas Electronic circuits, Engineering 100	4
Applied mechanics, Engineering 102A, 104A	6
Fluid Mechanics, Engineering 103A	3

Engineering

Applied thermodynamics, Engineering 105A, 130	7
Materials in design, Engineering 140	4
Measurements and laboratory, Mechanical Engineering 124, 176	5
Materials science, Engineering 142, 144, 145, 148	14
Applied mathematics, Engineering 180	3
Humanities-Social Sciences Electives	14
Technical Electives	29
Unrestricted Elective	1
Total Units	90

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study. See pages 85 and 101.

Mechanical Engineering

B.S. Major Requirements:

(Accredited by Engineers' Council for Professional Development)

Minimum units required: 180.

	UNITS
Subject Areas	
Electronic circuits, Engineering 100	4
Applied mechanics, Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics, Engineering 105A, 105B	6
Fluid mechanics, Engineering 103A, 103B	6
Mechanical design, Mechanical Engineering 121, 150	6
Controls and systems analysis, Mechanical Engineering 171	4
Measurements and laboratory: Engineering 102L, 103L, 105L, Mechanical Engineering 124, 176	8
Professional responsibilities, Engineering 190	3
Applied mathematics, Engineering 180	3
Technical Electives	21
Nine of the 21 units must be selected from Engineering prefix or Mechanical Engineering prefix courses.	
Humanities-Social Sciences Electives	15
Unrestricted Electives	2
Total Units	90

Mechanical Engineering/Aeronautical Engineering

B.S. Major Requirements:

Minimum units required: 180.

	UNITS
Subject Areas	
Electronic Circuits Engineering 100	4
Applied mechanics, Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics, Engineering 105A, 105B	6
Fluid mechanics, Engineering 103A, 103B	6
Mechanical design, Mechanical Engineering 121, 150	6
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

Laboratory, Engineering 102L, 103L, 105L, Mechanical Engineering 124, 176	8
Applied mathematics, Engineering 180	3
Technical Electives	14
Humanities-social sciences electives	15
Unrestricted electives	2
Total Units	90

Mechanical Engineering/Materials Science and Engineering

B.S. Major Requirements:

Minimum units required: 180.

	UNITS
Subject Areas	
Electronic circuits, Engineering 100	4
Applied mechanics, Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics, Engineering 105A, 105B, 130	10
Fluid mechanics, Engineering 103A, 103B	6
Mechanical design, Mechanical Engineering 121, 150, Engineering 140	10
Controls and systems analysis, Mechanical Engineering 171	4
Materials science: Engineering 148; choose two courses from Engineering 142, 144, 145	10
Measurements and laboratory, Mechanical Engineering 124, 176; Engineering 102L, 103L, 105L	8
Applied mathematics, Engineering 180	3
Professional responsibilities, Engineering 190	3
Humanities-Social Sciences Electives	15
Technical Elective	3
Unrestricted Elective	2
Total Units	90

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study. See pages 85 and 101.

COURSES IN ENGINEERING

Lower Division Courses

1. Plane Surveying (3) III.

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, III. Ramey

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 21A recommended (may be taken concurrently). An introduction to the profession of engineering and to the role of the engineer as a responsible agent for the planning and shaping of the human environment. (P/NP grading only.)

4. Engineering Graphics in Design (3) I, II. Henderson

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. Hatfield

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 signifi-

cance. Practice with an algebraic language (FORTRAN) in solving simple numerical and nonnumerical problems. Students who have had Mathematics 19 may receive only two units of credit. Students who have had Mathematics 29 may not receive credit for this course.

10. Technology and Society (3) II. Tardiff

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 the physical sciences. 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

Lecture—3 hours. Prerequisite: Mathematics 22B (may be taken concurrently); Physics 4C. Basic circuit analysis techniques; transient and steady-state solutions using differential equations.

35. Statics (3) I, II, III. The Staff (Hutchinson in charge)

Lecture—3 hours. Prerequisite: Mathematics 21C; Physics 4A. Force systems and equilibrium conditions with emphasis on engineering problems.

45. Properties of Materials (4) I, II, III. Mukherjee, Giedt, Munir

Lecture—3 hours; laboratory—3 hours. Prerequisite: sophomore standing in engineering. Introductory course on the properties of engineering materials and their relation to the internal structure of materials.

92. Internship in Engineering (1-5) I, II, III. The Staff (Brush 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.)

98. Directed Group Study (1-5) I, II, III. The Staff (Brush in charge)

Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. (P/NP grading only.)

Upper Division Courses

100. Electronic Circuits and Systems (4) I, II. Mitra, Gardner

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 17. Introduction to the theory and applications of analog and digital circuits and systems.

102A. Dynamics (3) I, II, III. Brewer

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. Hubbard, Yang

Lecture—3 hours. Prerequisite: course 102A. Topics in rigid body dynamics; elementary dynamics of vibrating systems; introduction to energy methods.

102L. Dynamics Laboratory (1) III. Henderson

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. White, Brandt

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; laminar, transition, and turbulent flow regimes.

103B. Elementary Fluid Mechanics (3) II, III. Dwyer, Lauder
Lecture—3 hours. Prerequisite: course 103A. Potential flow; open channel flow; boundary layer flow; one dimensional compressible flow.

103L. Fluids Mechanics Laboratory (1) III. White
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 (Herrmann in charge)
Lecture—3 hours. Prerequisite: course 35; Mathematics 22B, 22C (may be taken concurrently). Concepts of stress, strain, elasticity; stress and deformation analysis for axially loaded members, torsion of round shafts, bending, deflection, and shear of beams; combined stresses.

104B. Mechanics of Materials (3) II, III. The Staff (Herrmann in charge)
Lecture—3 hours. Prerequisite: course 104A. Beams: unsymmetrical loading, shear center, indeterminate problems, inelastic bending, buckling and lateral instability. Energy methods, failure theories; torsion of thin-walled sections.

104C. Mechanics of Materials (3) III. Hutchinson
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. Discussion of the buckling of plates and shells and the concept of local buckling of thin sections.

105A. Thermodynamics (3) I, II, III. Hoffman
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. Shackelford
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. Hoffman
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) I.
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.

110. Introduction to Engineering Principles (3) I, Kamopp
Lecture—3 hours. Prerequisite: open to all students not enrolled in the College of Engineering. Introduction to engineering principles and techniques for nonengineering students.

111. Electric Power Equipment (2) III. Chancellor
Lecture—2 hours. Prerequisite: course 17; concurrent enrollment in course 111L recommended. 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.

111L. Electric Power Equipment Laboratory (1) III. Chancellor
Laboratory—2 hours. Prerequisite: course 111 (concurrent enrollment recommended). Laboratory study of the electrical and mechanical characteristics of AC and DC electric power equipment.

115. Systems Diagnosis and Modeling (3) I, LaPatra
Lecture—3 hours. Prerequisite: upper division standing. The systems approach to complex problem definition. Analysis optimization and simulation techniques. Implementation of results. Micro and macro modeling. Application areas studied as projects may include social processes, economics, urban problems, justice systems, and others.

118. Probabilistic Systems Analysis (3) I, Algazi, Gardner
Lecture—3 hours. Prerequisite: Mathematics 21C. Probabilistic models and concepts in engineering. Introductory probability and statistics for engineers and scientists.

119. Scientific Writing (1-3) II. Shackelford
Lecture-discussion—1 hour; plus autotutorial modules. Prerequisite: English 1; upper division enrollment in an engineering curriculum. Analysis and practice of scientific writing; research methods, organization, proper style and format, oral presentation of scientific papers. Lecture and workshop discussion by English Department and engineering staff. (P/NP grading only.) (Same course as English 119.)

122. Introduction to Mechanical Vibrations (3) I, Beadle
Lecture—3 hours. Prerequisite: course 102B. Free and forced vibrations in lumped-parameter systems with and without damping; vibrations in coupled systems; electromechanical analogs; use of energy conservation principles.

130. Thermodynamics of Materials Processes (4) II. Mukherjee
Lecture—3 hours; discussion—1 hour. Prerequisite: Course 105A or consent of instructor. 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, semiconductor, thermoelectric power and thermionic energy conversion.

140. Materials in Engineering Design (4) III. Shackelford
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.

145. Recycling of Materials (3) II, Munir
Lecture—2 hours; discussion—1 hour. Prerequisite: courses 45 and 105A or consent of instructor. Discussion and analysis of the recycling of metallic, ceramic, and polymeric materials from an energy and material conservation point of view. Case studies emphasizing energy limitations and technical feasibilities of the recycling of common solid wastes.

148. Engineering Applications of Materials Principles (4) III. Mukherjee
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Engineering. The physical principles in metallic, polymeric and ceramic materials are discussed with emphasis 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, Baughn
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. Wooten
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. 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. Brandt
Lecture—2 hours; discussion—1 hour. Organization of the engineering profession; engineering and management; introduction to contracts, specifications, and business law; technical writing; oral presentations on the interaction between engineering and society.

192. Internship in Engineering (1-5) I, II, III. The Staff (Brush in charge)
Work-learn experience. Prerequisite: upper 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.)

198. Directed Group Study (1-5) I, II, III. The Staff (Brush in charge)
Prerequisite: consent of instructor. Group study of selected topics. (P/NP grading only.)

Graduate Course

291. Seminar in Teaching (1) III. 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)

Robert B. Fridley, Ph.D., Chairperson of the Department
Department Office, 2030 Bainer Hall

Faculty

Norman B. Akesson, M.S., Professor
Jaime Amoroch, Ph.D., Professor
Roy Bainer, M.S., L.L.D., Professor (*Emeritus*)

NOTE: For key to footnote symbols, see page 132.

Engineering: Applied Science

Robert H. Burgy, M.S., Professor
William J. Chancellor, Ph.D., Professor
Pictiaw (Paul) Chen, Ph.D., Lecturer
Robert B. Fridley, 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., Professor
Robert A. Kepner, B.S., Professor
Coby Lorenzen, Jr., M.S., Professor (Emeritus)
James N. Luthin, Ph.D., Professor
Miguel A. Marino, Ph.D., Associate Professor
R. Larry Merson, Ph.D., Associate 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
Verne H. Scott, Ph.D., Professor
R. Paul Singh, Ph.D., Assistant Professor
Theodor S. Streikoff, Ph.D., Professor
Henry E. Studer, M.S., Associate Professor
Wesley E. Yates, M.S., Professor

COURSES IN ENGINEERING: AGRICULTURAL

Lower Division Courses

- 1. The Agricultural Engineer in Tomorrow's World** (1) II. Fridley
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.)
- 98. Directed Group Study** (1-5) I, II, III. The Staff (Fridley 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 (Fridley in charge)
(P/NP grading only.)

Upper Division Courses

- 112. Engines for Agriculture, Industry and Transportation** (3) III. Goss
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; discussion-laboratory—3 hours. Prerequisite: Engineering 102B. Functional requirements, basic principles of operation and elements of field machinery design; use of instrumentation and computer techniques for analysis of specific machines. Offered in even-numbered years.
- 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 forestry 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. Prerequisites: 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. Garrett
Lecture—3 hours. Prerequisite: Mechanical Engineering 150. Test design and analysis of test data to evaluate design attributes such as functional adequacy, failure modes, reliability, maintainability and safety. Students may also gain experience with fabrication techniques by taking an optional noncredit laboratory.

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) II. Morrison
Lecture—3 hours. Prerequisite: Engineering 105A. Environmental and functional design of agricultural storage and production facilities; plans and systems; ventilating, heating, lighting, insulating; psychrometrics, energy balances, vapor transmission; solar heat loads, sol-air concept; methods of waste management.

***132. Unit Operations in Agricultural Processing** (4) II. Henderson
Lecture—3 hours laboratory—3 hours. Prerequisite: Engineering 103A and 105A. Thermodynamics and mass transfer principles applied to such processes as drying, dehydration, refrigeration, size reduction, separation, and materials handling. Offered in odd-numbered years.

***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.

150. Engineering Design Projects for Agriculture and Forestry (2) II. Garrett
Laboratory-discussion—two 2-hour sessions. Prerequisite: senior standing in engineering and one course from the following: courses 114, 125, 132, Civil Engineering 132A, 145, Mechanical Engineering 150. Individual or group projects in design of equipment and facilities for agriculture and forestry. Projects related to cultural equipment; harvesting, handling, food engineering, and processing equipment; water and waste management systems; structures and environmental control facilities.

198. Directed Group Study (1-5) I, II, III. The Staff (Fridley in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Fridley in charge)
(P/NP grading only.)

Graduate Courses

***215. Soil-Machine Relations in Tillage and Traction** (3) I. Chancellor
Lecture—3 hours. Prerequisite: courses 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 Agricultural and Food Processing (3) III. Henderson
Lecture—3 hours. Prerequisite: course 132 or the equivalent. Basic procedures applicable to agricultural 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, etc.

245. Agricultural Waste Management (3) I. Morrison
Lecture—2 hours; discussion—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. Offered in even-numbered years.

250. Design of Mechanical Systems (2) I. Fridley
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 166. 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.

290. Seminar (1) III. The Staff (Fridley 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 (Garrett in charge)
(S/U grading only.)

Engineering: Applied Science

(College of Engineering)

Frederick O. Wooten, Ph.D., Chairperson of the Department
Stewart D. Bloom, Ph.D., Vice-Chairperson of the Department
Department Office, 228 Walker Hall

Faculty

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 C. Peter DeNeef, Ph.D., Assistant Professor
 Sidney S. Fernbach, Ph.D., Lecturer
 Joseph A. Fleck, Ph.D., Lecturer
 John G. Fletcher, Ph.D., Lecturer
 Alexander Glass, Ph.D., Lecturer
 Abraham Goldberg, Ph.D., Lecturer
 Michael W. Guinan, Ph.D., Lecturer
 Robert I. Harrach, Ph.D., Lecturer
 Edwin B. Hooper, Ph.D., Lecturer
 William G. Hoover, Ph.D., Professor (*Adjunct*)
 Tony Huen, Ph.D., Lecturer
 Roger N. Keeler, Ph.D., Lecturer
 John Killeen, Ph.D., Professor
 Hans M. Mark, Ph.D., Lecturer
 Kenneth D. Marx, Ph.D., Lecturer
 Michael M. May, Ph.D., Lecturer
 George A. Michael, B.S., Lecturer
 Arthur A. Mirin, Ph.D., Lecturer
 William A. Newcomb, Ph.D., Lecturer
 Richard F. Post, Ph.D., Professor (*in Residence*)
 John E. Ranelletti, M.S., Lecturer
 George D. Sauter, Ph.D., Lecturer
 Michael Schwab, Ph.D., Lecturer
 John W. Shaner, Ph.D., Lecturer
 Peter C. Stevenson, Ph.D., Lecturer
 Wilson K. Talley, Ph.D., Professor
 C. Bruce Tarter, Ph.D., Lecturer
 Edward Teller, Ph.D., Professor (*Emeritus*)
 John J. Walton, Ph.D., Lecturer
 Charles S. Wetherell, Ph.D., Assistant Professor
 Frederick O. Wooten, Ph.D., Professor
 Yin Yeh, Ph.D., Associate Professor
 Mary E. Zosel, Ph.D., Lecturer

COURSES IN ENGINEERING: APPLIED SCIENCE

Davis

Upper Division Courses

- 115. Introduction to Numerical Methods for Computers** (3) I, II, III. The Staff
 Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems.
- 116. Application of Computers to Physical Problems** (3) III. DeGroot
 Lecture—3 hours. Prerequisite: course 115. Application of computers to the solution of physical problems. Boundary value and eigenvalue problems; partial differential equations and data approximation.
- 135A. Introductory Nuclear Science and Technology** (3) I, DeGroot
 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. DeNeef
 Lecture—3 hours; laboratory—3 hours. Prerequisite: Physics 110B and 112A, or Engineering 105A and Electrical 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.
- 198. Group Study** (1-5) I, II, III. The Staff (Chairperson 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 (Chairperson 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. Marx
 Lecture—3 hours. Prerequisite: course 205C. Numerical solution of partial differential equations. Difference methods for initial and boundary value problems. Problems in gas dynamics, neutron transport, meteorology, magnetohydrodynamics, plasma physics. Computer simulation of plasma and many-body problems.
- 230A-230B-230C. Structure of Matter** (3-3-3) I-II-III. 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) II-III-I, DeNeef, DeGroot
 Lecture—3 hours. Prerequisite: Electrical 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 Kinetic Theory with Applications.** (3-3-3) I-II-III. DeNeef, DeGroot
 Lecture—3 hours. Thermal equilibrium; plasma kinetic equations; linear Vlasov theory—Landau damping and beam plasma interactions; Non-linear Vlasov theory—Quasilinear effects, plasma turbulence and shocks, plasma sources and instabilities in controlled fusion.
- 290. Seminar** (1-2) I, II, III. The Staff (Chairperson in charge)
 Seminar—1-2 hours. (S/U grading only.)
- 298. Group Study** (1-3) I, II, III. The Staff (Chairperson in charge)
 Lecture—1-3 hours. Such topics as neutron physics, nuclear technology, advanced hydrodynamics, plasma physics, or advanced mathematics.
- 299. Research** (1-12) I, II, III. The Staff (Chairperson in charge)
 (S/U grading only)
- Livermore**
- Upper Division Courses**
- 112A. Introduction to Computing Science** (3) I, Michael
 Lecture—3 hours. Prerequisite: Engineering 5 or the equivalent or consent of instructor. Basic computing machine organizations and languages are analyzed. The concept of language hierarchies is introduced and assemblers are examined in detail. Several machines are presented to illustrate different computer and memory structures. For the whole course, very heavy emphasis is placed on learning by actual programming.
- 112B. Introduction to Computing Science** (3) II. Michael
 Lecture—3 hours. Prerequisite: course 112A or consent of instructor. Basic computing machine organizations and languages are analyzed. The concepts of list processing and symbolic computing are studied. Investigation of interpreters is begun as a special introduction to simulation languages.

- 115. Introduction to Numerical Methods for Computers** (3) I, Mirin
 Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems.

121A. Chemical Physics (3) I. Hoover
 Lecture—3 hours. Prerequisite: Chemistry 1C; Mathematics 101. Chemical thermodynamics; first and second laws of thermodynamics with emphasis on fundamentals; equations of state; phase diagrams; chemical equilibrium; phase transitions; partition functions.

121B. Chemical Physics (3) II. Hoover
 Lecture—3 hours. Prerequisite: course 121A. Chemical kinetics including mechanisms of chemical reactions, transition state theory, catalysis, and surface reactions; quantum theory of atoms; atomic spectra; Zeeman and Stark effects; transitions and selection rules; hyperfine interactions; the periodic table.

121C. Chemical Physics (3) III Hoover
 Lecture—3 hours. Prerequisite: course 121B. Molecular structure; molecular orbital and valence bond theories; molecular spectra; electronic, rotational and vibrational transitions; magnetic effects, Ligand field theory; the chemical bond.

134. Introduction to Electromagnetic Theory (3) I, Hooper
 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, Sauter
 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, Sauter
 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, Sauter
 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.

198. Group Study (1-5) I, II, III. The Staff (Chairperson 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 (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201A-201B. Complexity of Computer Computations (3-3) II, Fletcher; III, Booth
 Lecture—3 hours. Prerequisite: courses 112A-112B (or the equivalent); Electrical Engineering 119. Models of computation and measure of complexity. Relationship between various models. Basic data structures and programming techniques. Manipulation 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.

Engineering: Applied Science

202A-202B. Formal Languages and Automata Theory (3-3) II-III. Wetherell

Lecture—3 hours. Prerequisite: Electrical Engineering 119 (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.

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. Fletcher

Lecture—3 hours. Prerequisite courses 112A, 112B (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. Offered in even-numbered years.

210A-210B-210C. Advanced Methods of Computational Physics (3-3-3) I-II-III. Marx

Lecture—3 hours. Prerequisite: course 205C. Numerical solution of partial differential equations. Difference methods for initial and boundary value problems. Problems in gas dynamics, neutron transport, meteorology, magnetohydrodynamics, plasma physics. Computer simulation of plasma and many-body problems.

211. Computer Mathematics (3) II. Zosel

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. Wetherell

Lecture—3 hours. Prerequisite courses 112A-112B and Electrical Engineering 119 (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

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

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. Gödel's proof. Offered in odd-numbered years.

218. The Theory of Parsing (3) I, Beatty

Lecture—3 hours. Prerequisite courses 202A-202B. Course will discuss the basic techniques now available for parsing context-free languages. Detailed descriptions of various parsing algorithms, and proofs of their correctness, will be supplied. We will be particularly interested in the construction and use of these techniques in compiler-compilers and translator writing systems.

219. Computer Science Applications (3) III. Fletcher

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.

220A-220B-220C. Solid-State Chemistry (3-3-3) III-I-II. Borg

Lecture—3 hours. Prerequisite course 121B or 260B. Crystallography, equations of state, potential functions, phase transformations, thermodynamics of surfaces, order-disorder, thermodynamics of point defects in metals, semi-conductors and insulators, diffusion in solids, solid-state reactions, mineralogy. Applications of foregoing concepts and facts to materials and geoscience and semi-conductor technology.

221. Materials Science (3) II. Borg

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. The Staff

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. Schwab

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) II-III-I. Hoover

Lecture—3 hours. Prerequisite Electrical 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. Sauter

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

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.

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. Hoover

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.

275A-275B-275C. Plasma Physics (3-3-3) I-II-III. Hooper

Lecture—3 hours. Prerequisite: course 234C. The basic equations governing the behavior of a fully ionized plasma in a magnetic field; simple plasma configurations in controlled fusion research and space applications. Theory of plasma waves and instabilities. Transport coefficients and radiation phenomena.

285A-285B-285C. Advanced Plasma Physics (3-3-3) I-II-III. Post

Lecture—3 hours. Prerequisite: course 275C. 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.

290. Seminar. (1-2) I, II, III. The Staff (Chairperson in charge)

Seminar—1-2 hours. (S/U grading only.)

298. Group Study (1-3) I, II, III. The Staff (Chairperson in charge)

Lecture—1-3 hours. Such topics as computer science, plasma physics, materials science, laser applications, bio-medicine.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Engineering: Chemical

(College of Engineering)

Richard L. Bell, Ph.D., Chairperson of the
Department
Department Office, 3092 Bainer Hall

Faculty

Richard L. Bell, Ph.D., Professor
Ruben G. Carbonell, Ph.D., Assistant Professor
Alan P. Jackman, Ph.D., Associate Professor
Benjamin J. McCoy, Ph.D., Associate Professor
Frank R. McLarnon, Ph.D., Assistant Professor
J. M. Smith, Sc.D., Professor
Stephen Whitaker, Ph.D., Professor

COURSES IN ENGINEERING: CHEMICAL

Lower Division Courses

1. The Scope of Chemical Engineering (1) II. Smith
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 (Bell 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 (Bell in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

150A. Chemical Engineering Fluid Mechanics (3) II. Whitaker

Lecture—3 hours. Prerequisite: Engineering 102A. 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. Whitaker

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, Carbonell
Lecture—3 hours. Prerequisite: Chemistry 110A (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. McLarnon

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. McLarnon

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. Jackman, Bell

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. Jackman, Bell

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. Chemical Engineering Process Dynamics (4) I, III. McLarnon, Jackman

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 152B and 153. A study of stability and the transient state of chemical processing systems.

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, Carbonell
Lecture—3 hours. Chemical engineering applications of partial differential equations, tensors, systems of linear equations, and operational calculus.

198. Group Study (1-5) I, II, III. The Staff (Bell 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 (Bell 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, Whitaker

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 formula-

tion of rheological equations of state for viscoelastic fluids and fluid interfaces.

253B. Advanced Transport Phenomena (4) II. McLarnon
Lecture—4 hours. Prerequisite: course 253A. Continuation of course 253A, with 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

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. Carbonell

Lecture—3 hours. Prerequisite: courses 156B and 252. 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

Lecture—3 hours. Prerequisite: courses 154B, 156B. Unsteady-state process analysis, examples of first and second order process systems, coupling of mixed order processes 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 (Chairperson in charge)
Seminar—1 hour. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research. (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Engineering: Civil

(College of Engineering)

Edward D. Schroeder, Ph.D., Chairperson of the
Department
Department Office, 206 Walker Hall

Faculty

¹Jaime Amorocho, Ph.D., Professor (Civil
Engineering; Land, Air and Water Resources)

NOTE: For key to footnote symbols, see page 132.

Engineering: Civil

Kandiah Arulananadan, Ph.D., Associate Professor
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James A. Cheney, Ph.D., Associate Professor
David A. Crane, M.S., Lecturer
Yannis F. Dafalias, Ph.D., Assistant Professor
Otto J. Helweg, Ph.D., Assistant Professor
Leonard R. Herrmann, Ph.D., Professor
James R. Hutchinson, Ph.D., Professor
William K. Johnson, M.S., Lecturer
^{3,4} Ray B. Krone, Ph.D., Professor
Tenny N. Lam, D.Eng., Associate Professor
Bruce E. Larock, Ph.D., Associate Professor
James N. Luthin, Ph.D., Professor (*Civil Engineering; Land, Air and Water Resources*)
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Karl M. Romstad, Ph.D., Associate Professor
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Chih-Kang Shen, Ph.D., Associate Professor
Theodor S. Strelkoff, Ph.D., Professor (*Civil Engineering; Land, Air and Water Resources*)
Timothy J. Tardiff, Ph.D., Assistant Professor (*Civil Engineering; Environmental Studies*)
Michael A. Taylor, Ph.D., Associate Professor
¹George 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.
- 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)
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 stati-

cally 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 (may be taken concurrently). 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
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. Prestressing systems. Analysis and design of prestressed concrete structures; statically determinate and indeterminate structures; principles and applications of ultimate strength; applications to buildings, bridges, and tanks.
- 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, centrifugal pump, wave propagation.
- 142. Engineering Hydrology** (3) I, II. Amorocho
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.
- 143A. 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 pro-

jects. Consideration of policies; legislation; institutions; laws; public participation; water sources, quality data, and uses; economics; environmental concerns; and methodology.

- 143B. 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.
- 144. Groundwater Systems Design** (3) I, Marino
Lecture—3 hours. Prerequisite: course 142 (may be taken concurrently). Groundwater occurrence, distribution, and exploration. Quality of groundwater. Steady and non-steady groundwater hydraulics. Water wells, drilling methods, design criteria and specifications, construction and maintenance. Aquifer management, safe yield and overdraft. Artificial recharge. Conjunctive use of surface and groundwater.
- 145. Hydraulic Systems Design** (3) III. Amorocho
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.
- 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. Origin, nature, and management of radioactive wastes.
- 148A. Water Quality Management** (3) II, III. Tchobanoglous
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. Origins, characteristics, and amounts of air pollutants; atmospheric reactions and behavior of airborne wastes; methods of control.
- 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) II. Helweg
Lecture—3 hours. Prerequisite: senior standing. Role and purpose of analytical methods in planning and design of civil engineering systems. Basic theory and principles of mathematical, statistical and operations research methods. Applications in planning transportation, water resource wastewater and other civil engineering facilities.
- 161. Transportation Systems Engineering** (3) I, Lam
Lecture—3 hours. Prerequisite: Engineering 102A. Planning, design, and operation of transportation systems. Introduction to systems engineering and modelling. Characteristics of transportation systems. Conceptual design and functional operation of multi-modal systems.
- 162. Transportation Facilities Design** (4) II. Lam
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 10 and 171; course 161 recommended. 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, II, 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). Detailed study of the physical and mechanical properties of soils, including experimental determination of these properties and their engineering applications. Introduction to physicochemical principles and influence of physicochemical factors on soil behavior.

173. Soil Mechanics and Foundation Design (4) II. Shen
Lecture—4 hours. Prerequisite: courses 132B and 171. Site exploration, bearing capacity, footing design, lateral earth pressures, retaining walls, slope stability, theory of consolidation and application of foundation design, methods of minimizing settlements and effect of settlement on structures.

174. Nuclear Civil Engineering Laboratory (2) I, Cheney
Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing in engineering. Phenomenology and potentials of nuclear explosives as a construction tool. Hazards associated with underground detonation. Laboratory experiments on radioisotope transport in groundwater, cratering with explosives, and slope stability. Offered in odd-numbered years.

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 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 Geology 175.)

189A-J. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Chairperson 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.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Instruction in these variable-unit courses may be carried out by lecture or by laboratory, or by a combination of these two. Prerequisites: consent of instructor. Group study of selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: 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, nonlinear bending and lateral-torsional buckling of beam-columns, stability of structural frames, buckling strength and ultimate strength of plates.

203. Inelastic Behavior of Solids: 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. Herrmann

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 postbuckling 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 and 128 B (may be taken concurrently), or consent of instructor. Approximate analysis procedures; least-squared error, Galerkin and minimum residual methods. Construction of approximate solutions by the finite element method. Applications to one-, two- and three-dimensional problems in engineering. Introduction to time dependent and nonlinear problems.

212B. Finite Elements: Application to Structural Mechanics Problems (1) III. Herrmann

Lecture—1 hour. Prerequisite: courses 211 and 212A. Application of the finite element method to linear and non-linear two- and three-dimensional problems in continuum mechanics, and to plate and shell problems.

212C. Finite Elements: Application to Fluid Problems (1) III. Larock

Lecture—1 hour. Prerequisite: courses 212A, 141 or the equivalent. Discussion of finite element applications to a variety of flow problems. Possible topics include groundwater, viscous and inviscid flows, confined and free surface potential flows, diffusion-convection problems in lakes, estuaries or channels. Unsteady flows.

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 groundwaters; 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. Properties of the air and the atmosphere; atmospheric phenomena; factors determining air quality; origins, transport and degradation of atmospheric pollutants, effects of pollutants on man, plants, soil, and water.

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 (4) II. Chang

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A-1B-1C or the equivalent, Engineering 105A, and consent of instructor; Chemistry 5 or 110A recommended. The course introduces chemical principles underlying current practices in the examination and treatment of aqueous systems. Topics include: chemical equilibria, redox reactions, surface chemistry.

Engineering: Electrical

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. Schroeder
Laboratory—6 hours. Prerequisite: course 243B or consent of instructor. Study of selected biological systems used in wastewater management.

250. Urban Transportation Planning (3) II. Lam
Lecture—3 hours. Prerequisite: course 152 or consent of instructor. Study of urban travel demand characteristics and trends. Transportation study design, including surveys, inventories and use studies. Case studies of previous planning efforts.

251. Transportation Planning Models (3) III. Lam
Lecture—3 hours. Prerequisite: courses 153 and 250. Detailed study and application of mathematical models of urban transportation including trip generation, trip distribution, modal split, network assignment, and direct demand models. Brief discussion of land-use models.

252. Transportation Systems Analysis (3) III. Lam
Lecture—3 hours. Prerequisite: course 250. Readings and discussion of topics of special interest in transportation planning, including evaluation techniques, citizen participation, social and environment problems in system design, and technology of transportation.

253. Advanced Urban and Regional Planning (3) I. Tardiff
Lecture—3 hours. Prerequisite: consent of instructor. The city and regional planning process including land use inventories, plan formulation, evaluation, marketing and implementation. Mathematical models of urban growth.

254. Urban Transportation Attitudes and Behavior (3) III. Tardiff
Lecture—3 hours. Prerequisite: course 251 or consent of instructor. Recent studies of individual or household travel decisions. The role of attitudes in these decisions will be of major importance in travel demand analysis. Specific topics include transportation attitude studies and behavioral modeling. Appropriate statistical techniques. Offered in odd-numbered years.

255. Characteristics of Urban Transportation Systems (3) III. Lam
Lecture—3 hours. Prerequisite: course 161 or consent of instructor. Technological, service performance, and operational characteristics of urban passenger transportation systems. Systems considered include: private automobiles, taxis, demand-responsive transit, bus and bus rapid transit, rail transit, personal rapid transit, high-speed ground transportation, elevators, ferries, STOL, and others. 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 odd-numbered years.

271. Topics in Surface Water Hydrology (2) III. Burgy
Lecture—2 hours. Prerequisite: course 142 or Water Science 141 recommended. Applications of hydrologic principles in analysis of watershed processes, evaluation of watershed responses to management and hydrologic-environmental relationships. Offered in odd-numbered years.

272. Groundwater Flow and Seepage (3) II. Luthin
Lecture—3 hours. Prerequisite: course 144 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.

273. Analysis of Groundwater Systems (3) III. Marino
Lecture—3 hours. Prerequisite: course 144 or the equivalent; Mathematics 120 and Engineering Applied Science 116 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 even-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. Amorochio
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. Amorochio
Lecture—3 hours. Prerequisite: course 142 or Water Science 141 or the equivalent; Mathematics 22A, 22B, 22C, 24. 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. Strelkoff
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. Strelkoff
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 even-numbered years.

279. Advanced Mechanics of Fluids (4) I, Larock
Lecture—4 hours. Prerequisite: course 141 and Mathematics 24. 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.

281A. Advanced Soil Mechanics (3) I, Shen
Lecture—3 hours. Prerequisite: course 171. Theories of consolidation, secondary compression, stress distribution, bearing capacity, lateral earth pressures, shear strength, yielding of soils, creep effect of type of compaction on the behavior of compacted clays.

281B. Advanced Soil Mechanics (3) II, Shen
Lecture—3 hours. Prerequisite: course 281A. Theories of slope stability. Analysis of slope stability problems for static and dynamic loading conditions. Anisotropic stress conditions in soils. Lateral earth pressure theories. Design of anchored bulkheads.

282. Advanced Soil Laboratory (3) I, Shen
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 281A. Subsurface exploration, advanced laboratory techniques including consolidation, shear strength, pore water pressure measurement, electrical properties measurement, pavement design tests, field strength and load bearing tests.

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. Microscopic theories to explain yielding of soils.

285. Pavement Design and Soil Stabilization (3) II. Arulanandan
Lecture—3 hours. Prerequisite: course 171 or the equivalent. Principles and methods of pavement design for highway and airport pavements; purposes, principles, and methods of soil stabilization and design of stabilized pavement layers. Offered in even-numbered years.

287A. Soil Dynamics (3) I, Cheney
Lecture—3 hours. Dynamic soil properties, wave propagation in soils, seismic exploration, soil and foundation vibration, dynamic bearing capacity and penetration, response to blast loading, earthquake problems, soil-structure interaction.

287B. Earthquake Response of Soil Structures (3) III. Arulanandan
Lecture—3 hours. Prerequisite: course 281A; Engineering 122 or course 138 or course 287A. 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 (Chairperson 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. Chairperson in charge
Seminar—1 hour. Discussion of current graduate research, and guest lectures on recent advances. Oral presentation of individual study. Course required of graduate degree candidates. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson 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 (Chairperson in charge)
(S/U grading only.)

Engineering: Electrical

(College of Engineering)

V. Ralph Algazi, Ph.D., Chairperson of the
Department
Department Office, 3118 Bainer Hall

Faculty

V. Ralph Algazi, Ph.D., Professor
 Josef Berger, Ph.D., Lecturer
 George R. Branner, Ph.D., Associate Professor
 John N. Churchill, Ph.D., Associate Professor
 Andrew J. Dienes, Ph.D., Professor
 Richard C. Dorf, Ph.D., Professor
 Herman J. Fink, Ph.D., Professor
 Leonard Forbes, Ph.D., Associate Professor
 (Acting)
 William A. Gardner, Ph.D., Assistant Professor
 Lansing Hatfield, Ph.D., Assistant Professor
 Tien C. Hsia, Ph.D., Professor
 Hartley J. Jensen, Ph.D., Lecturer
 William G. Lane, Ph.D., Lecturer
 Jack W. LaPatra, Ph.D., Associate Professor
 Herschel H. Loomis, Jr., Ph.D., Professor
 Sanjit K. Mitra, Ph.D., Professor
 Earle W. Owen, D. Eng. Sci., Associate Professor
 John B. Powers, Ph.D., Professor (Emeritus)
 Anne-Louise Radimsky, Ph.D., Assistant Professor
 Robert J. Smith II, Ph.D., Lecturer
 Michael A. Soderstrand, Ph.D., Assistant Professor
 (Adjunct)
 Ronald F. Soohoo, Ph.D., Professor
 P. James Stoll, Ph.D., Lecturer
 Allen H. Wegner, Ph.D., Lecturer

**COURSES IN ENGINEERING:
 ELECTRICAL**
Lower Division Courses**1. Introduction to Electrical Engineering** (1) III. The Staff (Algazi in charge)

Lecture—1 hour. Electrical 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.)

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 Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

110A. Electronic Circuits (3) I, Churchill

Lecture—3 hours. Prerequisite: course 140B and Engineering 100. Analysis of linear amplifiers; single stage and multistage amplifiers, tuned amplifiers, oscillators.

110B. Electronic Circuits (3) II, Churchill

Lecture—3 hours. Prerequisite: course 110A. Nonlinear electronic circuits; large signal amplifiers, oscillators, and switching circuits.

111A. Electronics Laboratory (2) I, Gardner

Laboratory—6 hours. Prerequisite: course 110A (may be taken concurrently). Projects on the analysis, design, and evaluation of elementary transistor circuits for amplification and nonregenerative switching.

111B. Electronics Laboratory (2) II, Gardner

Laboratory—6 hours. Prerequisite: courses 110B (may be taken concurrently), 111A. Projects on the analysis, design, and evaluation of amplifiers (power, tuned, differential, multistage, operational), oscillators, and regenerative switches.

112A. Linear Systems Analysis (3) II, LaPatra

Lecture—3 hours. Prerequisite: Engineering 17. Properties and classification of linear systems. Characterization and analysis of discrete and continuous time systems by direct, convolution, and state variable techniques.

112B. Linear Systems Analysis (3) III, LaPatra

Lecture—3 hours. Prerequisite: course 112A. The formulation and analysis of continuous and discrete time linear systems by transform domain techniques. Included are Fourier transform, Laplace transform, and z-transform methods.

113. Digital and Sampled Data Systems (3) I, Hsia

Lecture—3 hours. Prerequisite: course 112B. Theories and techniques essential to the analysis of discrete time models for digital and sampled data systems. Digital computer simulation and analysis are emphasized. Review of difference equation models and z-transforms. Introduction to digital filters.

114A. Bipolar Integrated Circuit Applications (3) II, Forbes, Churchill

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110A, 110B (should be taken concurrently). Analysis and design of bipolar monolithic integrated circuits emphasizing circuit and system aspects rather than fabrication.

114B. MOS Integrated Circuit Applications (3) III, Churchill, Forbes

Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110B and 114A. 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. Bipolar Integrated Circuits Laboratory (3) II, Forbes, Churchill

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 140B. Projects in the fabrication of integrated circuit structures. Includes masking, doping, metallizing and testing. (P/NP grading only.)

115B. MOS Integrated Circuits Laboratory (3) III, Forbes, Churchill

Discussion—1 hour; laboratory—6 hours. Prerequisite: course 140B and 115A. Fabrication of metal-oxide semiconductor devices and circuits. Projects in design, semiconductor processing, testing and evaluation of MOS integrated circuits. (P/NP grading only.)

116. Network Analysis (3) I, LaPatra

Lecture—3 hours. Prerequisite: course 112B. Topics in modern network analysis, including two-port networks, matrix methods, graph theory, nonlinear circuits, and computer solutions.

117. Network Synthesis (3) III, LaPatra

Lecture—3 hours. Prerequisite: course 112B. An introduction to modern network synthesis techniques. Topics include one- and two-port networks, approximation problems, realization procedures, and filter theory.

119. Discrete Structures and Their Applications (3) I, Radimsky

Lecture—3 hours. Prerequisite: Mathematics 36 or a three-quarter sequence of a lower division mathematics course; course 170. Discrete structures. Applications to various areas of computer science. Sets, proofs, graphs. Semi-groups. Introduction to Automata Theory. Groups. Their use in coding theory and computer design. Boolean algebra. Application to logic design.

130A. Introductory Electromagnetics (3) I, Branner, Fink

Lecture—3 hours. Prerequisite: Mathematics 22B and 22C; Physics 4C strongly recommended. Static electric and magnetic fields, properties of materials.

130B. Introductory Electromagnetics (3) II, Branner, Fink

Lecture—3 hours. Prerequisite: course 130A and Engineering 17. Time-varying electromagnetic phenomena, Maxwell's equations. Propagation of plane electromagnetic waves, guided waves, 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; Ionospheric propagation.

132A. High-Frequency Systems, Circuits and Devices (3) I, Branner

Lecture—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 (3) II, Branner

Lecture—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 130B. 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) III, Branner

Lecture—3 hours. Prerequisite: course 112B; course 184A 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.

140A. Introduction to Physical Electronics (3) II, Churchill, Dienes

Lecture—3 hours. Prerequisite: course 130A. Introduction to fundamental physics of electronic conduction, developing models to explain operation of modern devices; equilibrium and nonequilibrium statistical mechanics, conductivity, diffusion, gaseous and beam electronics, plasmas, quantum mechanics.

140B. Introduction to Physical Electronics (3) III, Churchill, Dienes

Lecture—3 hours. Prerequisite: course 140A. Electrons in solids, band theory, electrons and holes, semiconductors, junction device physics and models.

145A. Solid-State Electronics (3) I, Churchill, Soohoo

Lecture—3 hours. Prerequisite: course 140B. Electric and magnetic properties of solids. Topics discussed include electrical conductivity, dielectric constant, and various types of magnetism in solids.

145B. Solid-State Electronics (3) II, Churchill, Soohoo

Lecture—3 hours. Prerequisite: course 145A. Electrical characteristics of dielectric and semiconducting materials, with application to such solid-state electronics devices as transistors, tunnel diodes, parametric amplifiers, and their associated circuits.

145C. Solid-State Electronics (3) III, Churchill, Soohoo

Lecture—3 hours. Prerequisite: course 145A. Characteristics of magnetic materials, with application to such magnetic devices as ferrite cores, thin films, and their associated computer memory and logic circuits.

***148. Superconductivity** (3) III, Fink

Lecture—3 hours. Prerequisite: course 130B or course 140B or equivalent. Fundamental properties of superconductors, magnetic properties of superconductors of the

NOTE: For key to footnote symbols, see page 132.

Engineering: Electrical

first and second kind, Phenomenological Landau-Ginsburg Theory, applications and devices.

150. Instrumentation Systems (3) III. Owen
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 100. Analytical and design methods common to all instrumentation systems; dynamic response; transducers; signal conditioning.

155A. Electronic Instrumentation for Biology, Chemistry and Medicine (3) I, Owen
Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 16A, 16B; a freshman physics course. Electric circuits, amplifiers, operational amplifiers, transducers and transducer systems, differentiators and integrators, dynamic response. Emphasis is on external characteristics of instruments and the errors inherent in measurement. Engineering majors cannot receive credit for this course.

155B. Electronic Instrumentation for Biology, Chemistry and Medicine (3) II, Owen
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 155A. Dynamic response, signal processing, electrical impedance, noise and interference, electrical safety, digital-to-analog conversion, digital data processing. Engineering majors cannot receive credit for this course.

157A. Control Systems (3) II. Hsia, Owen
Lecture—3 hours. Prerequisite: course 112B. 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.

***161. Introduction to Biomedical Systems** (3) II.
Lecture—3 hours. Prerequisite: Engineering 100. Introduction to the function of regulatory mechanisms in living organisms from an engineering systems point of view. Specific topics include heart and circulation, respiration, nerve and muscle, temperature regulation.

170. Computer Structure and Assembly Language (3) I, Loomis
Lecture—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.

173. Digital System Design (3) III. Hatfield
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 174. Study of the logic design and hardware implementation of digital systems, including computers, interfaces and special-purpose machines. Laboratory projects involving the design, simulation, and realization of digital subsystems.

174. Computer Organization (3) II. Hatfield
Lecture—3 hours. Prerequisite: course 170 and Engineering 100. Introduction to logical design fundamentals, including combinational and sequential techniques; register transfer operations. Number representation and implementation of basic arithmetic operations. Comparison of different computer organizations. Memory structures, input/output systems, with emphasis on hardware.

175. Computer Devices and Systems (3) III. Soohoo
Lecture—3 hours. Prerequisite: course 140B (may be taken concurrently). Essential elements of the computer and their interdependence. Characteristics of computer input and output devices, main and auxiliary storage including magnetic cores; films, drums, and discs, and the central processor. Computer integrated circuits and large scale integration (LSI).

176. Programming Languages and Compilers (3) I, Radimsky
Lecture—3 hours. Prerequisite: course 177. 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.

177. Data Structures and Programming Techniques (3) II. Radimsky
Lecture—3 hours. Prerequisite: course 170. Arrays, lists, tree structures. Searching and sorting techniques. Hash tables. Character strings. Recursion. List processing. Garbage collection. Files and file maintenance. Applications to various fields.

178. Operating Systems (3) III. Hatfield
Lecture—3 hours. Prerequisite: course 177. 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.

184A. Principles of Communication (3) II. Algazi, Gardner
Lecture—3 hours. Prerequisite: course 112B. Introductory course on modern methods and basic principles of communication, with emphasis on descriptive analysis of various modulation schemes employed in analog and digital communication systems. Applications to voice, picture and data communication.

184B. Principles of Communication (3) III. Gardner, Algazi
Lecture—3 hours. Prerequisite: Engineering 118 and course 184A. Continuation of course 184A with emphasis on statistical analysis and evaluation of analog and digital communication systems.

189A-K. Special Topics in Electrical Engineering (1-5) I, II, III. The Staff (Chairperson 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. 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.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson 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 (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Optimization Techniques with Applications (3) II. Mitra
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.

204. Digital Processing of Signals (3) III. Mitra
Lecture—3 hours. Prerequisite: course 112B. Theory and applications of digital processing of signals. Recursive and non-recursive digital filter design techniques, analysis of quantization effects. Homomorphic signal processing.

212A. System Analysis (3) I, Hsia, Owen
Lecture—3 hours. Prerequisite: course 112B. Mathematical representation and analysis of linear continuous-time dynamical systems by state variable techniques: matrices and linear spaces, state space, solutions of state variable equations, multivariable and composite systems, stability, controllability and observability, state feedback and state estimators.

212B. System Analysis (3) II. Hsia, Owen
Lecture—3 hours. Prerequisite: course 212A. Mathematical representation and analysis of discrete-time signals and dynamical systems: state space methods, transform methods, difference equations, sampling and data recon-

struction, systems with both continuous- and discrete-time elements, sampled-data control, digital simulation techniques.

213. Signal Theory (4) I, Gardner
Lecture—3 hours; problem session—1 hour. Prerequisite: graduate standing. Unified treatment of techniques for mathematical representation of signals and signal processing operations. Emphasis on physical interpretation of linear vector spaces, linear operators, transform theory, and optimum signal design.

***216. Network Theory** (3) II. Mitra
Lecture—3 hours. Prerequisite: course 112B or the equivalent. Foundations of network theory. Graph theory and network equations, network functions and representations, state equations, integral solutions, fundamentals of network synthesis, scattering matrices. Offered in even-numbered years.

217. Passive Filter Design (3) III. Mitra
Lecture—3 hours. Prerequisite: course 117 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. Offered in odd-numbered years.

218. Active Filter Design (3) III. Mitra
Lecture—3 hours. Prerequisite: course 117 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. Offered in odd-numbered years.

226A. Quantum Electronics (3) I, Fink, Dienes
Lecture—3 hours. Prerequisite: courses 130B and 140B 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. Fink, Dienes
Lecture—3 hours. Prerequisite: course 226A. Laser, 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 140B 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, Shoochoo
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, Fink, 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, Shoochoo
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.

***251. Nonlinear Control Systems** (3) III, Owen
Lecture—3 hours. Prerequisite: courses 157B and 212B. 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.

***252. Control System Optimization** (3) III, Hsia
Lecture—3 hours. Prerequisite: courses 157B and 212B. Optimization of systems by the adjustment of parameters; deterministic inputs, stochastic inputs. Optimization of systems by the calculus of variations: Pontryagin's maximum principle, Bellman's principle of optimality. Offered in even-numbered years.

***261. Biological Signals and Systems** (3) II, I.
Lecture—3 hours. Prerequisite: Human Physiology 260 or the combination of course 157A and a basic physiology course (such as Zoology 2 or Physiology 110A). Measurement and analysis of biological system dynamics by power spectral methods, with application to the cardiorespiratory and other systems. Methods of simulation and identification of linear and nonlinear biological system transfer relationships. Offered in odd-numbered years.

***270. Finite-State Machines** (3) II, Loomis
Lecture—3 hours. Prerequisite: course 119. 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 (3) I, Loomis
Lecture—3 hours. Prerequisite: course 173. Advanced topics in the design of digital systems; high-speed and high-rate arithmetic; digital design automation; high-performance computer organizations.

***272. Advanced Switching Theory** (3) II, Hatfield
Lecture—3 hours. Prerequisite: courses 119, 174. Topics in switching theory. Synchronous and asynchronous sequential circuits. Theoretical study of Boolean functions and their transformers. Special realization techniques for combinational and sequential circuits. Offered in even-numbered years.

***274. Advanced Computer Architecture** (3) III, 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.

***275. Computer Graphics** (3) III, Hatfield
Lecture—3 hours. Prerequisite: course 177. Study of the hardware and software implementation of interactive computer graphics systems. Display devices. Display files and transformations. Interactive graphics; devices and techniques. Problems in three-dimensional graphics. Examples of current systems; applications project required. Offered in even-numbered years.

277A-277B. Advanced Programming and Data Structures (3-3) I, III.

Lecture—3 hours. Prerequisite: course 177; course 178 recommended. Formal specification of data structures. Predicates and operators defined for classes of data structures. Data management systems: directory, data description. Data bases in large systems programming. Multiprocessing. File system organization and management. Traffic control in shared environment.

278A. Formal Languages and Related Automata (3) II, Radimsky
Lecture—3 hours. Prerequisite: course 119 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) III, I.
Lecture—3 hours. Prerequisite: courses 176, 177 and 278A. Compilation process. Storage allocation. Object code generation. Boot strapping. Parsing techniques. Table-driven compilers. Optimization techniques.

279. Artificial Intelligence (3) II, Radimsky
Lecture—3 hours. Heuristic programming. Representation of knowledge. Problem solving methods. Game playing. Machine perception of three dimensional space. Theorem proving. Semantic information processing.

284A. Random Signals and Noise (3) II, Gardner, Algazi
Lecture—3 hours. Prerequisite: Engineering 118. Fundamentals of the theory of random processes pertinent to communications, control and other physical applications. Review of probability theory. Characterization of random processes. Correlation functions and power spectral densities. Linear and nonlinear operations on random processes. Optimum linear filtering.

284B. Estimation and Detection of Signals in Noise (3) III, Gardner, Algazi
Lecture—3 hours. Prerequisite: course 284A. Application of statistical methods and models to the detection and estimation of signals in noise. Signal detection and hypothesis testing. Signal and parameter estimation. Continuous-waveform estimation. Applications to linear and nonlinear modulation.

285. Information Theory and Coding (3) I, Algazi, Gardner
Lecture—3 hours. Prerequisite: Engineering 118. Definition of a measure of information and study of its properties. Coding of discrete sources. Introduction to channel capacity and error-free communications over noisy channels. Coding of data for transmission over noisy channels. Offered even-numbered years.

***286. Advanced Topics in Statistical Communication and Control** (3) I, Gardner
Lecture—3 hours. Prerequisite: courses 212A, 213, 284B. Markov models and innovations—representations of random processes. Reproducing Kernel Hilbert spaces. Application to detection and estimation problems in communication and control. Recursive estimation and Kalman filtering. Offered in odd-numbered years.

289A-K. Special Topics in Electrical Engineering (1-5) I, II, III. The Staff (Chairperson 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. 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.

290. Seminar (1) I, II, III. The Staff (Chairperson 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 (Chairperson 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 (Chairperson in charge)
(S/U grading only.)

Engineering: Mechanical

(College of Engineering)

Allan A. McKillop, Ph.D., Chairperson of the Department

Department Office, 2020 Bainer Hall

Faculty

James W. Baughn, Ph.D., Assistant Professor
Charles W. Beadle, Ph.D., Professor
James B. Bergquam, Ph.D., Lecturer
Harry Brandt, Ph.D., Professor
John W. Brewer, Ph.D., Associate Professor
Harry A. Dwyer, Ph.D., Professor
Clyne F. Garland, M.S., Professor (*Emeritus*)
Warren H. Giedt, Ph.D., Professor
John F. Gislis, J.D., Lecturer
Jerald M. Henderson, D.Engr, Professor
(*Mechanical Engineering, Food Science and Technology*)

Myron A. Hoffman, Sc.D., Professor
Mont Hubbard, Ph.D., Assistant Professor
Maury L. Hull, Ph.D., Lecturer
Dean C. Kamopp, Ph.D., Professor
John D. Kemper, Ph.D., Professor
Brian E. Launder, Sc.D., Professor
Donald L. Margolis, Ph.D., Assistant Professor
Allan A. McKillop, Ph.D., Professor
Paul S. Moller, Ph.D., Lecturer
Amiya K. Mukherjee, D.Phil., Professor
Zuhair A. Munir, Ph.D., Professor
James F. Shackelford, Ph.D., Assistant Professor
Bruce R. White, Ph.D., Assistant Professor
An Tzu Yang, D.E.Sc., Professor

COURSES IN MECHANICAL ENGINEERING

Lower Division Courses

1. Mechanical Engineering (1) II, Shackelford
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.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (McKillop in charge)
Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

121. Manufacturing Methods (3) II, III, Beadle
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104A. Introduction to the methods employed in modern manufacturing, with particular emphasis on the interrelationships between engineering design and manufacturing methods. Introduction to the theoretical basis of metal forming.

124. Mechanical Engineering Laboratory (2) II, Dwyer
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.

127. Vehicle Aerodynamics (3) I, White
Lecture—3 hours. Prerequisite: Engineering 103B. Model-

NOTE: For key to footnote symbols, see page 132.

Engineering: Mechanical

ing and dimensional analysis. Instrumentation in experimental work. Aerodynamic loading on vehicle structures, boundary layer control, compressibility effects, static and elementary dynamic stability, propulsion.

128A-128B. Vehicle Design (2-2) II-III Moller

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. Hubbard

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.

150. Mechanical Design (3) I, II. Beadle

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 4, 104B; course 121 recommended. Applications of the principles of engineering mechanics in the design of mechanical components with special emphasis on stress concentration, theories of failure, fatigue, and fluctuating stresses.

151. Advanced Mechanical Design (3) II. Beadle

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 150. Introduction to computer aided design methods using finite element analysis, statistical design and reliability theory, and material selection to reduce friction and wear.

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 energy conversion processes with emphasis on chemical equilibrium and flame propagation.

162. Gas Turbine and Combustion Energy Systems (4) II, Hoffman

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B; course 161 strongly recommended. Study of energy systems utilizing fossil fuels with emphasis on gas turbines, combustion and system performance. Analysis of cycles and components for gas turbines, steam generators, internal combustion and alternative combustion engines for such applications as power generation and transportation.

163. Modern Power Generation (4) III. Baughn

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B; course 161 strongly recommended. Study of nuclear power plants with emphasis on the fluid mechanics, heat transfer and thermodynamics of existing and future nuclear reactors. Principles and prospects of future controlled fusion power plants. Comparison with combustion power plants.

165. Convective Momentum and Energy Transfer (4) II, Baughn

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103B and 105B. Fundamental concepts of energy transfer by convection: laminar and turbulent flow. Forced and free heat transfer. Boiling and condensation. Analysis of energy transfer devices: heat exchangers, heat pipes, pumps, hydraulic turbines, and flow in porous media.

166. Conductive and Radiative Energy Transfer (4) III, Brandt

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103B and 105B. Fundamental concepts of energy transfer by conduction and radiation. Application to direct energy conversion and solar collector devices.

171. Analysis, Simulation, and Design of Dynamic Systems (4) I, II. Hubbard, Margolis

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, Brewer

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) I, III, Beadle

Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 100 and 102A. Theory of measurements; measurement techniques for mechanical systems; transducers; data manipulation and processing; data digitization.

198. Directed Group Study (1-5) I, II, III. The Staff (McKillop 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 (McKillop in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

204. Heat Conduction (3) II, Brandt

Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 180, course 166. Steady-state and transient problems in heat conduction, using both mathematical and numerical methods of solution. Offered in even-numbered years.

205. Thermal Radiation (3) II, Baughn

Lecture—3 hours. Prerequisite: course 166 or consent of instructor. The transfer of radiant energy. Geometrical and spectral characteristics of systems involving thermal radiation. Gaseous radiation. Applications to solar energy systems. Offered in odd-numbered years.

210A. Advanced Fluid Dynamics (4) I, Lauder

Lecture—4 hours. Prerequisite: graduate standing. Derivation of Navier-Stokes and energy equations. Exact solutions of both equations. Low Reynolds number flow. Boundary layers for two-dimensional flow. Similarity solutions of boundary layer equations. Axially symmetric and three-dimensional boundary layers. Heat transfers in boundary layers.

210B. Advanced Fluid Dynamics (4) II, Lauder

Lecture—4 hours. Prerequisite: course 210A. Derivation and analysis of the equations of turbulent flow. Modeling of Reynolds stress terms based on experimental evidence; application to boundary layers, jets, and wakes. Compressible boundary layers, free convective flows, boundary layer mass transfer; other selected topics.

210C. Numerical Methods in Boundary Layer Flows (3) III, Dwyer

Lecture—3 hours. Prerequisite: course 210A. Development of the basic 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 these schemes with practical examples.

213. Theory of Jets (3) III, Brandt

Lecture—3 hours. Prerequisite: course 210A or consent of instructor. Turbulent jets of incompressible and compressible fluids; free jets and jets confined to finite spaces; wakes behind bluff bodies; practical applications of turbulent jets. Offered in even-numbered years.

214. Aerodynamics (3) III, White

Lecture—3 hours. Prerequisite: courses 127, 161, 165. Development and examination of the potential and viscous flow concepts useful in evaluating the aerodynamic loads and performance of flight vehicles. Applications of these concepts will be made through complete system analysis and optimization with particular emphasis on V.T.O.L. aircraft. Offered in even-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 odd-numbered years.

216. Advanced Thermodynamics (3) I, Dwyer

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. High Temperature Gas Transport Phenomena (4) I, Dwyer

Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Development and calculation of free molecule and continuum transport property models. Free molecular heat transfer and flow. Derivation of the Boltzmann Eq. with application to pure gases, gas mixtures and ionized gas. Chapman-Enskog and Lorentz solutions. Offered in even-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, Karnopp, Hubbard

Lecture—3 hours. Prerequisite: Engineering 122. Applications of vibration theory to systems with many degrees of freedom and continuous systems. Introduction to random vibrations.

222. Advanced Dynamics (3) I, Karnopp

Lecture—3 hours. Prerequisite: Engineering 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 Bernerster theory of the rational design of link mechanisms. Geometric concept of two- and three-dimensional rigid-body displacements, instantaneous invariants, higher order path curvature analysis, circle- and center-point curves. Graphic and computer methods for kinematic design.

226. Acoustics and Noise Control (4) I, Margolis

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.

240. Transport Phenomena 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 in dislocation theory are applied to explain plasticity of crystalline solids. Glide and climb of dislocations, strain hardening, recrystallization, theories of creep processes and interaction of dislocation with solute atoms, precipitates and impurity clouds are discussed. Offered in 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 Microstructural Analysis of Engineering Materials (4) III. Shackelford

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in engineering or consent of instructor; Engineering 142 and 148 recommended. Emphasis is on applications of electron optics to microstructural analysis and testing of engineering materials. Transmission and scanning electron microscopy, electron microprobe, and Auger electron spectroscopy are covered along with selected topics in advanced techniques of nondestructive testing. Offered in even-numbered years.

255. Computer-Aided Mechanical Design (3) III. Beadle

Lecture—2 hours; discussion—1 hour. Prerequisite: course 150. 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, Margolis

Lecture—3 hours. Prerequisite: course 172 or consent of instructor. Multiport models of mechanical, electrical, hydraulic and thermal devices; bond graphs, block diagrams and state space equations; Hamilton's principle for complex systems; formulation for analog and digital simulation; identification; instrumentation, approximate models of distributed systems.

271. Analysis and Control of Multivariable Systems (3) II. Brewer

Lecture—3 hours. Prerequisite: course 270 or consent of instructor. Analysis of multi-input, multi-output systems and synthesis of linear control; comparison of transfer functions and state space methods in feedback control design; application to physical systems for hardware realization.

272. Analysis and Design of Control Systems (3) III. Hubbard

Lecture—3 hours. Prerequisite: course 271 or consent of instructor. Synthesis of automatic control of mechanical engineering systems; both lumped and distributed

parameter systems and continuous and discrete time control will be considered.

275. Application of Modern Systems and Control Theory to Environmental Problems (4) III. Brewer

Lecture—2 hours; seminar—1 hour; laboratory—3 hours. Prerequisite: course 270, Engineering 160, or consent of instructor. Analysis simulation, and planning for social, geophysical, and ecosystem environments. Observability, controllability and optimality in socio-technological systems. Large, dynamic systems theory. General systems theory. Emphasis on interdisciplinary research. Offered in odd-numbered years.

280. Advanced Engineering Analysis (3) I, Brewer

Lecture—3 hours. Prerequisite: Engineering 180 or the equivalent. Applications in mechanical engineering of advanced analytical and numerical techniques. Topics include probability theory, calculus of variations, classification of differential equations, and advanced numerical methods.

290. Seminar (1) I, II, III. The Staff (McKillop 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.)

298. Group Study (1-5) I, II, III. The Staff (McKillop in charge)

299. Research (1-12) I, II, III. The Staff (McKillop in charge) (S/U grading only.)

English

(College of Letters and Science)

Peter L. Hays, Ph.D., Chairperson of the Department

Department Office, 100 Sproul Hall

Faculty

Arthur K. Amos, Jr., Ph.D., Assistant Professor

William E. Baker, Ph.D., Associate Professor

Sidney Berger, Ph.D., Assistant Professor

William M. Byrd, Ph.D., Associate Professor

Joan C. Carr, Ph.D., Assistant Professor

Everett Carter, Ph.D., Professor

Marianne Cooley, Ph.D., Assistant Professor

(English, Linguistics)

Elliot L. Gilbert, Ph.D., Professor

Sandra M. Gilbert, Ph.D., Associate Professor

Thomas A. Hanzo, Ph.D., Professor

Wayne Harsh, Ph.D., Professor (English,

Linguistics)

John O. Hayden, Ph.D., Professor

Peter L. Hays, Ph.D., Associate Professor

W. Jack Hicks, Ph.D., Assistant Professor

Michael J. Hoffman, Ph.D., Professor

Elizabeth R. Homann, Ph.D., Associate Professor

(Emeritus)

Robert H. Hopkins, Ph.D., Professor

Richard A. Levin, Ph.D., Assistant Professor

Arthur E. McGuinness, Ph.D., Professor

Diane L. Murray, Ph.D., Associate Professor

Gwendolyn B. Needham, Ph.D., Professor

(Emeritus)

Mary A. O'Connor, M.A., Lecturer

David A. Robertson, Ph.D., Assistant Professor

Winfried Schleiner, Ph.D., Associate Professor

Gwendolyn Schwabe, M.A., Lecturer

Karl J. Shapiro, Professor

*Daniel Silvia, Ph.D., Associate Professor

Brom Weber, Ph.D., Professor

Robert A. Wiggins, Ph.D., Professor

James L. Woodress, Ph.D., Professor

Celeste T. Wright, Ph.D., Professor (Emeritus)

Karl F. Zender, Ph.D., Lecturer (Subject A)

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	4
One course from English 1, 2, 3, 4A, 4B	2
English 45	4
English 30A, 30B, 46A, 46B (courses in each sequence should be taken in order)	16

Depth Subject Matter (for each emphasis, see below) 40

Core requirement 20

One course from each of the following five groups

(a) British Literature to 1500: English 111, 112, 113, 150A.

(b) Renaissance (1500-1600): 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, 175.

(e) 20th Century (British or American): English 136, 137, 138, 139, 146, 147, 150D, 152, 155D, 158B, 179, 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 113, 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, 175, 179, 180, 181, 182, 183, 184, 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, 175, 179, 180, 181, 182, 183, 184) 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 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

NOTE: For key to footnote symbols, see page 132.

English

Twelve elective units in upper division English courses	12
Total Units for the Major	64

Special Requirements for 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 with Linguistics Emphasis	64

Special Requirements for 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 103, 105A, 105B	12
One of the following: English 179, 181, or an ethnic literature course from outside the English department	4
Total Units with Teaching Emphasis	64

Special Requirements for 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 with Writing Emphasis	64

Units for Graduation only. English 117, 195, 197I, 197T, and 197TC provide units for graduation but do not count toward the major in English.

Recommended for Non-Majors. English 117.

Subject A. Students must have passed Subject A before taking any course in English.

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. A. K. Amos, W. E. Baker, S. Berger, W. M. Byrd, J. C. Carr, E. Carter, M. Cooley, S. M. Gilbert, W. Harsh, J. O. Hayden, P. L. Hays, W. J. Hicks, R. H. Hopkins, A. E. McGuinness, D. L. Murray, D. A. Robertson, W. Schleiner, 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 page 97.

Teaching Credential Subject Representatives. W. Harsh, M. Cooley. See also page 107 for more details on the Teacher Education Program.

Prerequisites. One course from 1, 2, 3, 4A, 4B 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.

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. E. L. Gilbert

COURSES IN ENGLISH

Lower Division Courses

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 nonstandard-English backgrounds who do not qualify for English for Foreign Students. Course worth 6 units toward minimum study list unit 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 (Harsh 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-discussion—4 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.

4A, 4B. Backgrounds for English Literature (4,4) A: I, II, III; B: I, II, III. The Staff (Zender in charge)
Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement; course 4A is not prerequisite to 4B. This course, designed to introduce English majors to essential background material, will concentrate on such major literary works as *The Iliad*, the Bible, *The Aeneid*, and *The Divine Comedy*. Frequent writing assignments will be made.

5F. Introduction to Creative Writing: Fiction (4) I, II, III. The Staff (Zender in charge)
Lecture—2 hours; discussion—2 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—2 hours; discussion—2 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing poetry. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

***20. Intermediate Composition** (4) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Designed primarily for non-majors who wish to improve their skills in expository and/or technical writing; includes basic principles of rhetoric and rules of usage in present-day English.

25. English for Foreign Students (5) I. 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, III. 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—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American literature from the seventeenth century to 1830.

30B. Survey of American Literature (4) II. Wiggins
Lecture—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American literature from 1830 to 1900.

30C. Survey of American Literature (4) III. Wiggins, Robertson
Lecture—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. American literature of the twentieth century.

***43. Critical Reading of Drama** (4) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) III. The Staff (Chairperson in charge)
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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. Masterpieces of English Literature (4) II, III. The Staff (Chairperson in charge)
Lecture—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) I, II, III. The Staff (Chairperson in charge)
Lecture—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected works of principal writers from 1800 to the 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—4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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, 4A, 4B. 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.

103. 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, 4A, 4B. Instruction and practice in a variety of modes of composition. Study areas will be Sections (a) general, (b) legal writing, (c) article writing, and (d) report writing. Frequent written assignments. Required of teaching credential candidates. May be repeated twice for credit in different area of emphasis.

105A. Language (4) I, III. Cooley, Harsh

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Present-day English grammar and pronunciation according to the perspectives of traditional grammar and contemporary linguistics. Preparation for stylistic analysis and historical study of English language and literature. Required of teaching credential candidates.

105B. Language (4) II. Harsh

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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. (Same course as Linguistics 105C.)

***105D. Linguistics, Literature, and Composition** (4) III. Harsh

Lecture—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) III. Schleiner

Seminar—3 hours; special project. Prerequisite: one course from courses 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 Linguistics 107.)

110A. Introduction to Principles of Criticism (4) II. Hayden

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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. Old English and Early Medieval Literature (4) II. Berger

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) III. Silvia

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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.

113. Chaucer (4) I, Silvia

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. *Troilus and Criseyde*, selected *Canterbury Tales*; central ideas in the fourteenth century.

116. Sixteenth Century Poetry and Prose (4) III. Amos

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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, The Staff (Chairperson in charge)

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) II, III. The Staff (Chairperson in charge)

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works from Shakespeare's later period. Courses 117A-117B-117C need not be taken in sequence.

119. Scientific Writing (1-3) I, II, III. The Staff (Chairperson in charge)

Lecture—1 hour; discussion plus autotutorial modules. Prerequisite: satisfaction of Subject A requirement and 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 Department and science department staff. May be repeated for credit for up to a total of 4 units. (P/NP grading only.) Same course as Engineering 119.

120. Earlier Seventeenth-Century Poetry and Prose (4) II. Zender, Schleiner

Lecture—3 hours; term paper or the equivalent. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major authors, forms, and styles. Donne, Jonson, Marvell, Bacon, Browne, Hobbes. Tradition and revolution.

122. Milton (4) I, Schleiner

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Selected major works, including *Paradise Lost*.

***123. Dryden and His Contemporaries** (4) II.

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) III. McGuinness

Lecture—3 hours; term paper or the equivalent. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The Augustan

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) I, Levin

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Readings in Johnson, Goldsmith, Boswell, and others; the poetry of the era concluding with Blake.

130. Early Romantic Literature (4) II. Hayden

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Blake, Burns, Wordsworth, Coleridge, Scott; the eighteenth century background and the development of Romantic concepts of imagination.

***132. Later Romantic Literature** (4) I, S. Gilbert

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Byron, Shelley, Keats. Individualism and revolt.

133. Early Victorian Literature (4) I, Murray

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) III. E. Gilbert

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) II. E. Gilbert

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Lawrence, Eliot, Forster, and others. Post-war attitudes. Modern psychology and the awareness of myth.

***138. British Literature from 1940 to the Present** (4) II. Hanzo

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) I, McGuinness

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. A study of Yeats, Joyce, George Moore, John Synge, James, Stephens and others.

***140. Origins of American Literature** (4) III. Weber

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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. Carter

Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) III. Carter

Lecture—3 hours; term paper. Prerequisite: one course

English

from courses 1, 2, 3, 4A, 4B. 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) I, Carter
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Religion, local color, social criticism, naturalism, *fin de siècle* aestheticism; Twain, James, Crane, Dreiser, Howells.

146. Modern American Literature: 1914-1940 (4) I, Hays
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) II, Hicks
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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, Berger
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) III, Amos
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Shakespeare's contemporaries in the drama, including Webster, Jonson, Beaumont and Fletcher, and others. The revenge play and tragicomedies; post-Shakespearean development of dramatic action and blank verse.

150C. English Drama from 1642 to 1890 (4) III, Hopkins
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Restoration and eighteenth-century drama, including Congreve, Sheridan, and others.

150D. British Drama from 1890 to the Present (4) III, McGuinness
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. The rise of dramatic realism; the chief reactions against it. Emphasis on Shaw, O'Casey, Osborne, and others.

152. American Drama from Its Beginnings to the Present (4) II, Hays
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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, Hopkins
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Realism and the rise of the modern novel. Defoe, Richardson, Fielding, Sterne, and Smollett.

155B. The English Novel: 1770-1850 (4) II, Byrd
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sense and Sensibility in the novel. Walpole, Radcliffe, Austen, Scott, Dickens, Bronte sisters.

155C. The English Novel: 1850-1900 (4) I, E. Gilbert
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major Victorian novelists: their theory and practice. Dickens, Thackeray, Trollope, Eliot, Meredith, and Hardy.

155D. The English Novel: 1900 to the Present (4) II, Hanzo
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major figures including Conrad, Joyce, and Lawrence. Impressionism, the revolt

against naturalism; the experimental novel; the anti-modernist reaction.

156. The Short Story (4) I, Hoffman
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) II, Hoffman
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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) I, Robertson
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Major American novelists of the twentieth century. Faulkner, Hemingway, Fitzgerald, and others.

***160. The English Lyric** (4) III, Wright
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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, Carr
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Studies in the development of the epic.

171. English Bible as Literature (4) III, Robertson
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Old Testament poetry and prophecy; the Gospels and certain Epistles.

173. The Literature of Science Fiction (4) III, Hanzo
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Study of the literary modes and methods of science fiction. The course will analyze representative novels and short stories which exemplify major themes and styles in this genre—e.g., time travel; alternative universes; utopian, anthropological, sociological science fiction.

175. American Literary Humor (4) II, Weber
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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—3 hours; papers. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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, Wiggins
Lecture—3 hours; paper. Prerequisite: one course from courses 1, 2, 3, 4A, or 4B, and one from 30A, 30B, 30C, 45, 46A, 46B, 46C. A study of the 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) I, Hicks
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. 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 American Literature** (4) I, Weber
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Sexual expression in poetry and prose from the colonial period to the present; cultural sanctions, literary conventions, eroticism and pornography; selected readings include Byrd, Franklin,

Hawthorne, Melville, Whitman, James, O'Neill, Hemingway, Miller, and Roth.

183. Film as Narrative (4) II, Baker
Lecture—2 hours; discussion—1 hour; film viewing—1½-2 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B; 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.

***187. Literature and Other Arts** (4) I, II, III, The Staff (Chairperson in charge)
Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of the relationship between the forms of literature and the forms of the other arts, with detailed study of one of the crucial periods of artistic development in western culture.

188. Special Topics in Literary Studies (4) I, II, III, The Staff (Chairperson in charge)
Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of a special topic drawn from English or American literature. Course will be offered in sections according to the topic studied, and papers will be assigned. Limited enrollment.

189. Study of a Major Writer (4) I, II, 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.

195. English Instruction of Foreign Students (1-4) II, III, Schwabe
Consultation with coordinator; actual instruction. Prerequisite: advanced standing in English, linguistics, anthropology, or psychology. Guided practice of teaching English pronunciation, grammar, and sentence structure to foreign students through language clinics and tutorials. Does not fulfill requirement for major. (P/NP grading only.)

196. Stylistics (4) III, Harsh
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.)

197I. Internships in English (2-4) I, II, III, The Staff (Chairperson in charge)
Field work. Prerequisite: one course from courses 1, 2, 3, 4A, 4B. Internships in fields where English majors can practice their skills. Does not fulfill requirements for the major. May be repeated for credit for a total of 12 units. (P/NP grading only.)

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 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 instructor. Does not fulfill requirement for major. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-4) I, II, III, The Staff (Chairperson in charge)
Discussion—1-4 hours. Prerequisite: one course from courses 1, 2, 3, 4A, 4B, 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, Woodress
Lecture—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) I, Hayden
Lecture—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.

***204. American English from 1600 to Present Day** (4) II, Harsh, Cooley
Lecture—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, Berger
Lecture—3 hours; written reports; individual conferences. The language of Anglo-Saxon England; readings in Old English prose and poetry.

***206. Beowulf** (4) III.
Lecture—3 hours. A study of the poem and the Heroic Age of Germanic literature.

***207. Middle English** (4) I, Cooley
Lecture—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, Cooley
Lecture—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) II, Harsh
Lecture—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, II, III. The Staff (Chairperson in charge)
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) III.
Lecture—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.

230. Study of a Major Writer (4) II, Zender
Seminar—3 hours; conferences with individual students—1 hour; research papers. Artistic development of one major writer and his intellectual and literary milieu. May be repeated for credit when a different writer is studied.

232. Problems in English Literature (4) II, Berger; III, Hayden, Cooley
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, Hicks
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
Seminar—3 hours. Historical introduction to dramatic theory; the genres of tragedy, comedy, and tragicomedy.

235. Fiction (4) II, Hanzo; III, Murray
Seminar—3 hours. Theories of fiction as reflected in the practice of writers from the eighteenth century to the present.

***236. Poetics** (4) III, Shapiro
Seminar—3 hours. Metaphor, style and structure in English poetry from the sixteenth century to the present.

237. Modern Critical Theory (4) III, 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) I-II-III. Silva
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

242A-242B-242C. Sixteenth-Century Literature (4-4-4) I-II-III, Amos
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Courses 242A and 242C will not be given 1976-77.

***244A-244B-244C. Shakespeare** (4-4-4) I-II-III.
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

246A-246B-246C. Seventeenth-Century Literature (4-4-4) I, _____; II, Schleiner; III, Levin
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of course.) Course 246A will not be given Fall 1976.

248A-248B-248C. Eighteenth-Century Literature (4-4-4) I-II-III, Byrd
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Course 248C not to be given Spring 1977.

***250A-250B-250C. Romantic Literature** (4-4-4) I-II-III, Hayden
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

252A-252B-252C. Victorian Literature (4-4-4) I-II-III, E. Gilbert
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Courses 252A not to be given Fall 1976.

***254A-254B-254C. Twentieth-Century British Literature** (4-4-4) I-II-III, Hanzo
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

256A-256B-256C. Early American Literature (4-4-4) I-II-III, Weber
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Course 256A not to be given Fall 1976.

***258A-258B-258C. American Literature: 1800 to the Civil War** (4-4-4) I-II-III, Carter
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

260A-260B-260C. American Literature: Civil War to 1914 (4-4-4) I-II-III, Woodress
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.) Course 260C not to be given Spring 1977.

***262A-262B-262C. American Literature after 1914** (4-4-4) I-II-III, Hicks
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

***264A-264B-264C. Studies in Modern British and American Literature** (4-4-4) I-II-III, Hoffman
Seminar—2 hours; conference—1 hour. (Deferred grading only, pending completion of sequence.)

290F. Seminar in Creative Writing of Fiction (4) I-II-III. The Staff (Shapiro in charge)
Seminar—2 hours; 1 hour conference weekly; 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. Course not to be given Winter 1977.

290P. Seminar in Creative Writing of Poetry (4) I, II, III. The Staff (Shapiro in charge)
Seminar—2 hours; 1 hour conference weekly; 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. Course not to be given Spring 1977.

298. Directed Group Study (1-4) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Individual Study (1-4) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Special Study for the Doctoral Dissertation (1-8) 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) III, Cooley
Lecture—2 hours. Prerequisite: senior or 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.

390A. Teaching English at the College Level (2) I, Zender
Lecture-discussion—2 hours; observation of freshman English courses—2 hours. Prerequisite: graduate standing. Consideration of the problems and techniques of teaching English composition at the college level. (S/U grading only.)

390B. Teaching English at the College Level (2) II, Zender
Lecture-discussion—2 hours; observation of freshman English courses—2 hours. Prerequisite: graduate standing. Consideration of the problems and techniques of teaching literature at the college level. (S/U grading only.)

397. College-Level Internship (2) I, II, III, Hays
Internship—3 hours. Prerequisite: courses 390A-390B or teaching experience. Internship with area college and community college English departments. (S/U grading only.)

Entomology

(College of Agricultural and Environmental Sciences)

Donald L. McLean, Ph.D., Chairperson of the Department
Department Office, 367 Briggs Hall (752-0483)

NOTE: For key to footnote symbols, see page 132.

Entomology

Faculty

Oscar G. Bacon, Ph.D., Professor
 Stanley F. Bailey, Ph.D., Professor (Emeritus)
 Martin C. Birch, D.Phil., Assistant Professor
 Richard M. Bohart, Ph.D., Professor
 Warren R. Cothran, Ph.D., Associate Professor
 Sean S. Duffey, Ph.D., Assistant Professor
 Lester E. Ehler, Ph.D., Assistant Professor
 Norman E. Gary, Ph.D., Professor
 Albert A. Grigarick, Jr., Ph.D., Professor
 Andrew P. Gutierrez, Ph.D., Associate Professor
 Charles L. Judson, 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
 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
 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., Associate Professor
 Robert K. Washino, Ph.D., Associate 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, 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. Equal 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)	6
Bacteriology (Bacteriology 2)	4
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, 101, 102, 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	4
Rhetoric (Rhetoric 1)	4
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 101 and the *Announcement of the Graduate Division* for further details.

Graduate Advisers. See *Class Schedule and Room Directory*.

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 1 but students who have taken this course may take course 1 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.

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.

101. Insect Structure and Function (4) II. Birch
 Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100 or consent of instructor. General principles of the evolutionary, functional and comparative aspects of insect morphology. Head and thorax as functional mechanisms, comparative and functional study of insect organ systems, cuticle, sense organs and current research topics in morphology.

102. Insect Physiology (4) I. Judson
 Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or the equivalent; Chemistry 8B; course 101 recommended. Basic mechanisms and processes by which insects maintain themselves and adapt to the environment. Laboratory exercises illustrate these mechanisms while introducing procedures and techniques of entomological research.

103. Systematic Entomology (4) III. Bohart
 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. Cothran
 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, Bohart, Grigarick
 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. Pre-

requisite: course 105 or consent of instructor. Collection and comparative analyses of insect faunas from selected ecological zones in California. Offered in odd-numbered years.

109. Field Taxonomy and Ecology (7) (Extra Session—Summer) Bohart
 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, II. Grigarick, Bacon
 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.

119. Apiculture (3) II. Gary, Peng
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 119 or consent of instructor. 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.

***121. Insect Behavior** (4) I, Gary
 Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in one of the biological sciences or consent of instructor. Evolution of behavior, sense organs, specific types and patterns of behavior, comparative behavior, learning, and applied aspects of behavioral phenomena. Analysis of movies on behavior. Offered in even-numbered years.

123. Classification of Immature Insects (4) I, 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 mycoplasma.

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: introductory course in entomology 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.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

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 diseases of man 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. Theis (School of Medicine) in charge; Lavoipierre (Veterinary Microbiology); Maggenti (Nematology); Washino
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. Theis (School of Medicine) in charge; Lavoipierre (Veterinary Microbiology); Maggenti (Nematology); Washino
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.

198. Directed Group Study (1-5) I, II, III, (Summer). The Staff (McLean in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, (Summer). The Staff (McLean in Charge)
(P/NP grading only.)

Graduate Courses

201. Theoretical Aspects of Pest Management (3) II. Gutierrez
Lecture—2 hours; discussion—1 hour. Prerequisite: Mathematics (statistics) 131A-131B-131C, Mathematics 21A-21B-21C, and knowledge of Fortran. The theory of crop ecosystem analysis and modelling using various crop-pest models.

202. Advanced Insect Physiology (2) III. Judson
Lecture—2 hours. Prerequisite: course 102 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 102 or Zoology 142. Investigations of selected aspects of insect physiology. Independent projects may be undertaken. Offered in odd-numbered years.

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 diseases of man 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 Entomological 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.

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, Mathematics 13 or the equivalent. Philosophy of research and principles of scientific enquiry 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 enquiry 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 (2) I, II, III. The Staff (Ehler in charge)
Seminar—2 hours. Prerequisite: graduate standing. (S/U grading only.)

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. (S/U grading only.)

292. Seminar in Insect Physiology (2) I, Judson, McLean, Birch
Seminar—2 hours. Prerequisite: course 102. Critical examination of areas of current interest to insect physiology and biochemistry. (S/U grading only.)

293. Seminar in Systematic Entomology (2) III. Bohart, Lange, 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. (S/U grading only.)

294. Seminar in Insect Ecology (2) III. Cothran, Ehler, Gutierrez
Seminar—2 hours. Prerequisite: graduate standing and 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. (S/U grading only.)

295. Seminar in Agricultural Entomology (2) I, II. Bacon, Lange, Grigarick, Cothran, Ehler
Seminar—2 hours. Prerequisite: course 110. Discussion of advanced topics relating to the principles of pest insect population management. (S/U grading only.)

296. Seminar in Bee Biology (2) I, Thorp, Gary, Peng
Seminar—2 hours. Prerequisite: course 119 or equivalent. Discussions of behavior, ecology, management, and general biology of bees (Apoidea) with emphasis on the honeybee. (S/U grading only.)

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. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (McLean in charge)
(S/U grading only.)

299. Research (1-12) I, II, III, (Summer). The Staff (McLean in charge)
(S/U grading only.)

Environmental Horticulture

(College of Agricultural and Environmental Sciences)

Wesley P. Hackett, Ph.D., Chairperson of the Department
Department Office, 140 Environmental Horticulture Building (752-0130)

Faculty

¹Seymour M. Gold, Ph.D., Associate Professor
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
Anton M. Kofranek, Ph.D., Professor
Harry C. Kohl, Jr., Ph.D., Professor
Andrew T. Leiser, Ph.D., Professor
John H. Madison, Jr., Ph.D., Professor
Allan S. Mills, Ph.D., Assistant Professor
Jack L. Paul, Ph.D., Associate Professor
Warren G. Roberts, M.S., Lecturer
Roy M. Sachs, Ph.D., Professor
Robert L. Thayer, Jr., M.A., Assistant Professor

Related Major Programs and Graduate Study. See the undergraduate majors in Environmental Planning and Management (page 204) and Plant Science (page 276); and for graduate study see page 101.

Related Courses. See Plant Science.

COURSES IN ENVIRONMENTAL HORTICULTURE

Lower Division Courses

6. Introduction to Environmental Plants (3) III. Hackett
Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 2. Growth, form, and origin of

Environmental Planning and Management

plants used in landscape and home discussed in relation to their uses and climatic and cultural requirements. Students learn to identify environmental plants. Only 2 units of credit allowed students who have had course 9.

9. Environmental Plants for the Home and Community

(1) III. Kofranek
Laboratory—3 hours. Recommended for non-majors. Identification of most common woody and herbaceous plants used in home and landscape. Brief introductory comments about plants prior to going on walking field trips.

10. Landscape Horticulture for the Home and Community

(3) I, III. Ryugo (Pomology); 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.

99. Special Study for Lower Division Students (1-5) I, II, III.

The Staff (Kofranek in charge)
(P/NP grading only)

Upper Division Courses

104. Landscape Construction (3) I, Madison

Lecture—2 hours; laboratory—3 hours. Prerequisite: Environmental Planning and Management 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.

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) III, 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 Technology (4) II, Kofranek

Lecture—3 hours; laboratory—3 hours; one all-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) I, 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) I, 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 (3) II, Harris

Laboratory—3 hours; discussion-testing—2 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.

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

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)

Seminar—2 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 (Hackett 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)

Faculty

See under the Department of Environmental Horticulture.

The Major Program

The Environmental Planning and Management major provides opportunities to study the relationships between man and the environment through a common core of courses, and the development of special competence in one of five options shown below. Positions illustrative of each option are listed to indicate the employment opportunities in the public or private sector that may be available

to graduates with additional study and/or experience.

1. Environmental Interpretation emphasizes interpretative programs and communication processes to promote ecological and historical awareness and understanding: park naturalist, outdoor education specialist, conservation information officer.

2. Environmental Planning is a preprofessional program emphasizing the use of information to develop alternatives for decisions on the form, function, and future of urban and natural areas: urban and regional planner, planning consultant, resource analyst.

3. Landscape Architecture is a preprofessional program emphasizing the design and development of landscapes: landscape architect, landscape contractor, recreation planner.

4. Landscape Management emphasizes development, maintenance, and operation of landscaped areas and facilities: park superintendent, landscape contractor, golf course superintendent, maintenance contractor.

5. Park and Recreation Administration is a preprofessional program that emphasizes the administrative processes in the allocation, development, and management of park and recreation systems, areas, and facilities: park and recreation director, park ranger, park superintendent, resort manager, recreation planner.

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.

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. Equal or more comprehensive courses may be taken with the adviser's approval. *Courses shown without parentheses are required.*)

	UNITS
Common Core Courses (Lower Division)	70
Chemistry (Chemistry 1A or 10)	4†
Physics (Physics 2A or 10)	3†
Earth Sciences (Geography 1, Geology 1, Soil Science 2 or Water Science 2) ..	6†
Biology (Biological Sciences 1 or 10)	4†
Mathematics (Mathematics 13, 16A, 16B, 19, 29, 36 or Agricultural Science and Management 150)	6†
Environmental quality (Environmental Planning and Management 1)	3
Landscape design (Environmental Planning and Management 20, 22)	6
Economics (Economics 1A, 1B or 2A)	4†
Other social sciences: introductory courses in at least two of the following subject areas: cultural anthropology (Anthropology 2), cultural geography (Geography 2), psychology (Psychology 1), sociology (Sociology 1)	11†
Expository writing (English 1)	4
Public speaking (Rhetoric 1 or 3)	4
Humanities elective	4
Common Core Courses (Upper Division)	
Urban and regional planning (Environmental Planning and Management 110)	4

Outdoor recreation (Environmental Planning and Management 116) 4

General ecology (Botany 117, Entomology 104, Environmental Studies 100 or Zoology 125) 3†

Depth Subject Matter 80

Environmental Interpretation Option

Chemistry 1B 5

Botany 2 5

Zoology 2 6

Entomology 100 5

Environmental horticulture (Environmental Horticulture 6) 3

Environmental Planning and Management 160 3

Plant taxonomy (Environmental Horticulture 105 or Botany 108) 4

Animal ecology (Zoology 125, Entomology 104 or Environmental Studies 125) 3†

Plant ecology (Botany 101, 117 or Plant Science 101) 3†

Meteorology (Atmospheric Science 20 or Geography 3) 3†

Resource economics (Agricultural Economics 147 or 148) 4

History (History 183A, 183B, 189A or 189B) 8

Communication (English 5F, 5P, 20, 100F, 100P, 103; Rhetoric 3, 42, 51, 100, 151, 130, 140, 141 or 151) 8

Individual requirements‡ 20

Environmental Planning Option

Natural sciences (Botany 2 and Wildlife and Fisheries Biology 10 or Zoology 2; or with approval, such courses as, Environmental Studies 126, Atmospheric Science 20, Water Science 120, Zoology 116) 7†

Environmental awareness (Environmental Studies 144) 4

Design and development of great cities (Art 168) 4

Urban geography (Geography 155) 4

Urban economics (Economics 125A) 4

Urban society (Sociology 143) 4

Drafting and perspective (Design 21) 4

Local government and politics (Political Science 100) 4

Cartography (Geography 105) or Interpretation of aerial photography (Geography 106) 4

Public mechanisms for controlling land use (Environmental Studies 173) 4

Individual requirements‡ 37

Landscape Architecture Option

Botany 2 5

Wildlife and Fisheries Biology 10 or Zoology 2 4†

Introduction to environmental plants (Environmental Horticulture 6) 3

Design (Art 16, Design 21, or Engineering 4) 3†

Three dimensional design (Art 5, 112, or 121A) 4

Landscape construction (Environmental Horticulture 104) 3

Taxonomy and ecology of environmental plants (Environmental Horticulture 105) 4

Landscape horticulture (Environmental Horticulture 130A, 130B, 133) 5†

Design of recreation environments (Environmental Planning and Management 136) 3

Site planning and design (Environmental Planning and Management 151) 4

Advanced landscape construction (Environmental Planning and Management 154) 4

Plant selection for environmental design (Environmental Planning and Management 155) 3

Landscape design problems (Environmental Planning and Management 183, 184) 8

NOTE: For key to footnote symbols, see page 132.

Individual requirements‡ 27

Landscape Management Option

Botany 2 5

Wildlife and Fisheries Biology 10 or Zoology 2 4†

Landscape construction (Environmental Horticulture 104) 3

Taxonomy and ecology of environmental plants (Environmental Horticulture 105) 4

Landscape horticulture (Environmental Horticulture 128A, 128B or 130A, 133) 5†

Pest control (Entomology 110, Nematology 110, Plant Pathology 120, Plant Science 120) 8

Plant Science 101, 102, or 109 7

Fundamentals of business organization (Agricultural Economics 112) 4

Environmental awareness (Environmental Studies 144) 4

Individual requirements‡ 36

Park and Recreation Administration Option

Botany 2 5

Wildlife and Fisheries Biology 10 or Zoology 2 4†

Introduction to environmental plants (Environmental Horticulture 6) 3

Landscape horticulture (Environmental Horticulture 130A, 130B, 133) 5†

Park administration (Environmental Planning and Management 122) 4

Planning of recreation environments (Environmental Planning and Management 134) 4

Design of recreation environments (Environmental Planning and Management 136) 3

Park operations (Environmental Planning and Management 144) 4

Urban economics (Economics 125A) or natural resources economics (Agricultural Economics 147) 4

Public administration (Agricultural Economics 112, Political Science 181, 182 or 183) 4

Environmental awareness (Environmental Studies 144) 4

Individual requirements‡ 36

Unrestricted Electives 30

Total Units for the Major 180

Major Adviser. R. W. Harris (*Environmental Horticulture*).

Related Courses. See Agricultural Economics 147, 148; and courses in Environmental Studies and Resource Sciences.

COURSES IN ENVIRONMENTAL PLANNING AND MANAGEMENT

Questions pertaining to the following courses should be directed to the instructor or to the Department of Environmental Horticulture, 140 Environmental Horticulture Building.

Lower Division Courses

1. Environmental Quality (3) I, Hodgson
Lecture—3 hours; one Saturday field trip. Components of environmental quality, significant issues, relationships and

†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. 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 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.

implications for planning, design, management and interpretation of urban and natural environments.

20. Introduction to Landscape Design (3) I, Thayer
Lecture—3 hours. Recommended for non-majors. Design principles and criteria used in analyzing, evaluating, and developing the visual and functional aspects of landscaped areas.

22. Landscape Design (3) I, II, Thayer
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 20; Design 21 recommended. Practice in analysis and design with reference to landscape problems.

Upper Division Courses

110. Urban and Regional Planning (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. 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, policy issues, alternatives, the future, innovation and the profession.

116. Outdoor Recreation (4) I, Mills
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, Mills
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. Applied Communication for Environmental Planners and Managers (4) I, Hodgson
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: English 1 and Rhetoric 1 or 3. Communication principles and techniques are applied to the development and implementation of environmental plans and management programs. Major topics are: diffusion of environmental innovations, administrative communications, and citizen inputs for environmental planning and management.

134. Recreation Planning (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 110, 116; course 122 recommended. 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.
Lecture—2 hours; laboratory—3 hours; one Saturday field trip. Prerequisite: courses 1, 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 Operations (4) III, Harris
Lecture—3 hours; laboratory—3 hours; one all day field trip. Prerequisite: course 116; courses 122 and Environmental Horticulture 130A, 130B or 133 recommended. Planning, execution, and supervision of field maintenance and operations with emphasis on performance budgeting, personnel practices, and scheduling. Familiarization with different areas, techniques, and technology to develop and maintain park and recreation areas.

151. Site Planning and Design (4) I.
Studio sessions which commingle lecture, discussion, and studio work—two 4-hour sessions. Prerequisite: course 22; Art 16 or Design 21. Consideration of the site and the landscape architect's role. Design and working drawings of residential areas, plazas and other open spaces.

154. Landscape Construction Studio (4) II
Studio laboratories which commingle lecture, discussion, and studio work—two 4-hour sessions. Prerequisite: Environmental Horticulture 104. Topographic and grading problems in landscape construction. Design and structural relationships; graphic and computational exercises; working drawings.

Environmental Studies

155. Plant Selection for Environmental Design (3) II.

Laiser

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 20; Environmental Horticulture 6. 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 22 and 155; Environmental Horticulture 105. Application of aesthetic, functional, and horticultural principles to the composition of the planted landscape and the development of planting plans.

160. Environmental Interpretation (3) III. Hodgson

Lecture—2 hours; laboratory—3 hours; two field trips. Prerequisite: course 125. Principles and analysis of interpretative techniques, media, materials and programs of public park and recreation agencies, museums, botanical and zoological gardens, schools and organizations.

161. Natural Park Ecosystems (4) III. Harding

Lecture—2 hours; discussion—1 hour; field trips; a field project with oral and written report. Prerequisite: at least one upper division course in ecology (Environmental Studies 100, Zoology 125, Botany 117 or Entomology 104). Ecological principles are applied to selected habitats of natural parks of California. These ecosystems are contrasted in terms of productivity, mineral cycles, diversity, succession, etc. Effects of human use are stressed.

183. Senior Landscape Design Problem (4) II.

Studio sessions which commingle lecture, discussion, and studio work—two 4-hour sessions. Prerequisite: senior standing in landscape architecture option of EPM major. Solution of an individual landscape design problem including preparation of working drawings.

184. Senior Landscape Design Problem (4) III.

Studio sessions which commingle lecture, discussion, and studio work—two 4-hour sessions. Prerequisite: senior standing in landscape architecture option of EPM major. Solution of a larger scale, group landscape design problem including preparation of working drawings.

193. Internship in Environmental Interpretation (4) II.

III. Roberts, Harding

Internship—8 hours; research and writing—4 hours. Prerequisite: senior standing and consent of instructor. Interns develop original educational programs for parks, historic landmarks, botanical or zoological gardens, museums, or schools and present these and other programs to several audiences. Usually an entire work day each week is required.

196. Environmental Planning and Management Study Tour (4) I, Harris

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.)

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.

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 Studies

(Intercollege Division)

Geoffrey A. Wandesforde-Smith, Ph.D.,

Chairperson of the Division and Associate
Dean of Environmental Studies

Division Office, 3132 Wickson Hall (752-3026)

Faculty

Gerald C. Bond, Ph.D., Assistant Professor
(Geology)

James C. Cramer, Ph.D., Assistant Professor
(Sociology)

William G. Davis, Ph.D., Associate Professor
(Anthropology)

Theodore C. Foin, Jr., Ph.D., Associate Professor
Charles R. Goldman, Ph.D., Professor
Marvin Goldman, Ph.D., Professor (Radiological
Sciences)

William J. Hamilton III, Ph.D., Professor

James A. Harding, Ph.D., Professor
(Environmental Horticulture)

William A. Harvey, M.S., Lecturer
Robert A. Johnston, M.S., Assistant Professor

Jess F. Kraus, Ph.D., Associate Professor
(Community Health)

Jerry A. Moles, Ph.D., Assistant Professor
(Anthropology)

Eldridge M. Moores, Ph.D., Professor (Geology)

Leonard O. Myrup, Ph.D., Associate Professor
(Environmental Studies, Atmospheric Science)

Benjamin S. Orlove, Ph.D., Assistant Professor

Thomas M. Powell, Ph.D., Assistant Professor
(Environmental Studies, Physics)

Peter J. Richerson, Ph.D., Assistant Professor

Paul A. Sabatier, Ph.D., Assistant Professor

Seymour I. Schwartz, Ph.D., Associate Professor

Alvin D. Sokolow, Ph.D., Associate Professor
(Political Science)

Robert Sommer, Ph.D., Professor (Psychology)

Timothy J. Tardiff, Ph.D., Assistant Professor
(Environmental Studies, Civil Engineering)

James W. Valentine, Ph.D., Professor (Geology)

Harry O. Walker, Ed.D., Lecturer (Resource
Sciences)

Geoffrey A. Wandesforde-Smith, Ph.D., Associate
Professor (Environmental Studies, Political
Science)

Kenneth E. F. Watt, Ph.D., LL.D., Professor
(Zoology)

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 man-environment relations. There is no undergraduate major in Environmental Studies. Courses offered by the Division are designed primarily to 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.

Courses allow students to learn analytical methods useful in understanding a broad range of physical, biological and human problems relating to the environment. They also allow students to apply theories, principles and analytical skills to environmental problem-solving. Undergraduates in any college, school, or department can take these courses as electives to help establish the relevance of their discipline to environmental problems. The courses can also constitute a core program for undergraduate and graduate students developing a special competence in subjects such as ecology, resource sciences, environmental planning, engineering, or other fields important to environmental management.

Current Information. Through its continuing contacts with many other departments and teaching divisions on the campus, the Division develops each year a variety of special courses and workshops that cannot be listed here. Students are advised to check with the Division Office and with the expanded course description handbook of the College of Agricultural and Environmental Sciences for up-to-date information about courses.

Graduate Study. The faculty of the Division offers graduate instruction through the M.S. and Ph.D. degree programs of the Graduate Group in Ecology, as well as through the graduate programs of the 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 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.

12. Environmental Planning (3) II. Johnston

Lecture—3 hours. Prerequisite: course 10 or consent of instructor. A survey of basic planning concepts. Land resource analysis, policy formation and institutional design are seen as an integrated process.

12L. Environmental Planning Laboratory (1) II. Johnston Laboratory—3 hours. Prerequisite: course 12 (may be taken concurrently) and consent of instructor. Application of concepts learned in course 12 to a long-range regional planning problem. Small teams work on year 2000 plans for regions of California. Limited enrollment.

20. Energy, Man and the Environment (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. Upper division and graduate students should refer to Engineering 160.

20L. Energy, Man and the Environment Laboratory (2) I, Walker Discussion—1 hour; laboratory—3 hours. Prerequisite: course 20 (may be taken concurrently). On-site study programs at representative types of energy conversion units, includes hydroelectric, geothermal, fossil fuel, and nuclear facilities. Saturday trips primarily.

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.

100L. General Ecology Laboratory (2) I, Richerson Laboratory—6 hours. Prerequisite: course 100 (may be taken concurrently). This course will offer laboratory and field experience in the methods of ecological investigation. Students will be taught basic methods of population measurement, community analysis, productivity measurement.

101. Principles of Human Ecology (4) II. Davis, Richerson Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 and/or 10; 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 Anthropology 101.)

(a) Environmental Science

110. Principles of Environmental Science (4) II. Powell, Watt 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. G. Fisher 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.

115. Bioenvironmental Consequences of Nuclear Technology (3) III. M. Goldman Lecture—2 hours; 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 predictions of the response of the most sensitive physiological systems will be emphasized. (Same course as Radiological Sciences 180.)

116. The Oceans (3) II. Powell, Cowen (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.)

(b) Ecological Analysis

***121. Population Ecology** (4) I, The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 2, Zoology 2, 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 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.

125. Social Systems of Animals and Man (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 on man's social conventions and evolution. Aggression, dominance, communication, sexual behavior, cooperation and social regulation of density are considered from an evolutionary perspective.

126. Environmental Health (4) II. Kraus Lecture—3 hours; discussion—1 hour. Contemporary problems in environmentally dependent aspects of individual and public health. Diseases associated with pollution of air, water, soil and food; infectious diseases such as malaria and encephalitis; and stress phenomena related to urban crowding, noise and occupation will be considered. (Same course as Community Health 126.)

128. Analysis and Simulation of Complex Systems (5) I, Schwartz, Foin Lecture—4 hours; discussion—1 hour. Prerequisite: computer programming (FORTRAN or ALGOL), calculus, and statistics. Techniques for 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 simulation 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, statistics, 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 to 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, 141 (may be taken concurrently) or Anthropology 141. 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.

142. Culture and Environmental Perception (4) II. Moles 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.)

144. Environmental Awareness (4) II, III. Sommer, Coss (Psychology)

Lecture—3 hours; discussion—1 hour. Interactions of people with man-made environments. Research methods for evaluating designed environments and reviews of current research in environmental psychology. Illustrations include the connection between the design of schools, parks, hospitals, and dormitories on the behavior of the occupants. No credit will be given to students who have completed course 170. (Same course as Psychology 144.)

145. Population Analysis (4) III. Cramer (Sociology) 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.

(d) Aquatic Ecosystems Analysis

150A. Physical and Chemical Oceanography (4) I, Powell Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 or Geology 116; Physics 4B; 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 Geology 150A.)

150B. Geology of the Oceans (3) II. Moores, Bond Lecture—3 hours. Prerequisite: Geology 60, 60L, 105, or consent of instructor. Introduction to the origin and geologic evolution of ocean basins. Topics include composition and structure of oceanic crust, marine volcanism, and deposition of marine sediments. Special emphasis on applying sea floor spreading theory to interpreting geologic history of the ocean floor. (Same course as Geology 150B.)

150C. Biological Oceanography (3) III. Valentine, Richerson 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. 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. 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, Wandersforde-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 implica-

Environmental Toxicology

tions of public sector entrepreneurship, and the effects of technology on alternative decision structures.

161. Environmental Law (4) II. The Staff (Wandesforde-Smith in charge)

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. A. D. Sokolow

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, Cahill

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. Selected case studies demonstrating the institutional constraints faced in environmental problem-solving in the public sector. Cases of legislative, regulatory, and administrative-management agencies covering national, international and subnational problems in environmental management will be discussed.

168A. Methods of Environmental Policy Evaluation (4) II. Schwartz, Tardiff

Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 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, Tardiff

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.

***169. Environmental Movements and Public Policy** (4) I. Sabatier

Lecture—4 hours; term papers. Prerequisite: Political Science 107 or consent of instructor. Course will develop a conceptual framework for analyzing the historical development of social movements and their role in public policy-making. This will then be applied to the history of the environmental movement in the U.S.

(f) Environmental Planning

172. Theories of the Planning Process (4) II. Johnston

Lecture—2 hours; discussion—2 hours. Prerequisite: completion of at least one of the following: course 12, 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) III. Johnston

Lecture—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.

(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. Internships in Environmental Management (2-4) I, II, III. The Staff

Prerequisite: consent of instructor. Supervised program of student internships with public agencies having responsibility for environmental control. Deals with the application and evaluation of theoretical concepts through work experience and systematic observation. (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

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)

Wendell W. Kilgore, Ph.D., Chairperson of the Department

Department Office, 111 Environmental Toxicology (752-1142)

Faculty

T. 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
Dennis P. Hsieh, Ph.D., Associate Professor
Wendell W. Kilgore, Ph.D., Professor
Robert I. Krieger, Ph.D., Assistant Professor
Ming-yu Li, Ph.D., Lecturer
James N. Seiber, Ph.D., Associate 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. 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 school.

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. Equal or more comprehensive courses will be accepted. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	58-63
Biological sciences (Biological Sciences 1)	5
Other biological sciences (entomology, zoology, botany, bacteriology, physiology)	10-12
Chemistry (Chemistry 1A-1B-1C and 8A-8B or 128A-128B-128C)	21-24
Environmental science (Environmental Toxicology 10)	3
Mathematics (Mathematics 16A-16B or 21A-21B, 13, 19)	13-15
Physics (Physics 2A, 2B)	6
Depth Subject Matter	53
Biochemistry 101A, 101B	6
Environmental Toxicology 101, 112A, 112B, 114A, 114B, 130A-130E, 138	23
Electives selected for area of specialization with approval of adviser	24
Breadth Subject Matter	50
English and/or rhetoric	8
Social sciences and humanities electives†	12
Electives selected with approval of adviser to complement program options: courses in agricultural economics, environmental studies, sociology, political science, and psychology are particularly recommended	30
Unrestricted Electives	13-20
Total Units for the Major	180

Major Adviser. D. P. Hsieh.

Related Courses. See Atmospheric Science 131, Environmental Studies 10, 131.

COURSES IN ENVIRONMENTAL TOXICOLOGY

Lower Division Courses

10. Protecting the Quality of the Environment (3) III.

Krieger
Lecture—3 hours. Prerequisite: open to science and non-science majors. Discussion of man-made hazards in the world around us, including how they might be minimized. Topics to be covered: air, water and soil pollution; food safety, waste disposal. Included are household, domestic and agricultural chemicals and industrial toxicants.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Kilgore in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Principles of Environmental Toxicology (3) I, Byard, Crosby
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.

112A. Toxicants in the Environment (3) II. Burau, Crosby
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, Crosby
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 112A or consent of instructor. Continuation of course 112A. Toxic chemicals—primarily pollutants—in the environment; concepts and techniques of sampling, detecting, and measuring toxicants of current concern; collection, interpretation, and use of analytical data.

114A. Biological Effects of Toxicants (3) II. Byard
Lecture—3 hours. Prerequisite: course 101, Biochemistry 101A-101B or consent of instructor. (Biochemistry 101B may be taken concurrently.) A lecture course designed to illustrate the biological effects of toxic substances in living system. Topics to be covered: fate and mechanism-of-action of representative toxins; types of effects; symptoms; and antidotes and antagonists.

114B. Biological Effects of Toxicants: Comparative Toxicology (4) III. Henderson, Byard, Kilgore
Lecture—1 hour; discussion—2 hours; laboratory—3 hours. Prerequisite: course 114A or consent of instructor. Continuation of course 114A. A lecture and laboratory course designed to illustrate basic principles of toxicology and to acquaint students with laboratory techniques for evaluating potential toxicity of chemicals.

130A-E. Selected Topics in Environmental Toxicology (3) I, II, III. The Staff (Kilgore 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 (3) I, Hsieh
Lecture—3 hours. Prerequisite: Chemistry 1A, 1B, 1C; Biological Sciences 1 or 10. Toxicological aspects of major contaminants of the ambient air, with emphasis on their environmental fate and biological functions. Factors governing air quality criteria and standards. Alternatives in air pollution abatement.

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.

197T. Tutoring in Environmental Toxicology (1-5) I, II, III. The Staff (Kilgore 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 (Kilgore in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Kilgore in charge)
(P/NP grading only.)

Graduate Courses

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 odd-numbered years.

***220. Analysis of Toxicants** (3) III. 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) III. 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.

290. Seminar (1) I, II, III. The Staff (Kilgore 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 (Kilgore 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.)

298. Group Study (1-5) I, II, III. The Staff (Kilgore 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 (Kilgore in charge)
(S/U grading only.)

Epidemiology and Preventive Medicine

(School of Veterinary Medicine)

Walter W. Sadler, D.V.M., M.P.H., Chairperson of the Department
Department Office, 2075 Haring Hall

Faculty

Henry E. Adler, D.V.M., Ph.D., Professor
Raymond A. Bankowski, D.V.M., Ph.D., Professor

Epidemiology and Preventive Medicine

Nemat O. Borhani, M.D., M.P.H., Professor
(Internal Medicine and Community Health)

Robert B. Bushnell, D.V.M., Lecturer
Fred N. Cooper, B.S.P.H., Lecturer
Paul D. DeLay, D.V.M., Lecturer
Constantin Genigeorgis, D.V.M., M.S., Ph.D., Associate 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)

Hans P. Riemann, D.V.M., Ph.D., Professor
Arnold S. Rosenwald, D.V.M., Ph.D., Lecturer
Roger N. Ruppner, D.M.V., M.V.Sc., M.P.V.M., Assistant Professor

Walter W. Sadler, D.V.M., M.P.H., Professor
Robert Schneider, D.V.M., M.S., Associate Professor (Adjunct)

Calvin W. Schwabe, D.V.M., M.P.H., Sc.D., Professor

Patton L. Smith, D.V.M., M.P.V.M., Lecturer
Richard Yamamoto, Ph.D., Professor
George K. York, Ph.D., Lecturer
Alvin D. Wiggins, Ph.D., Associate Professor

COURSES IN EPIDEMIOLOGY AND PREVENTIVE MEDICINE

Upper Division Courses

100. Preventive Veterinary Medicine: Orientation (4) I. The Staff (Wiggins 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. Perspectives in Veterinary Medicine (2) I. 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 even-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, Wiggins

Lecture—2 hours; laboratory—3 hours. Prerequisite: Mathematics 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, Wiggins

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, Wiggins

Lecture—2 hours; laboratory—3 hours. Prerequisite:

NOTE: For key to footnote symbols, see page 132.

Fermentation Science

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.

111. Animal Hygiene (3) III. Howarth

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)

Graduate Courses

210A. Advanced Epidemiology I (6) I, Schwabe, Ruppner

Lecture—4 hours; discussion—2 hours. Prerequisite: a degree in veterinary, human or dental medicine, 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 II (3) II. Riemann

Lecture—1 hour; seminar discussions and laboratory—6 hours. Prerequisite: courses 210A, and 103B (may be taken concurrently). Continuation of course 210A with emphasis on use of increasingly more sophisticated epidemiological and statistical methods for the study of diseases in populations.

210C. Advanced Epidemiology III (3) III. Riemann

Lecture—1 hour; seminar discussions and laboratory—6 hours. Prerequisite: courses 210B, and 103C (may be taken concurrently). Continuation of courses 210A and 210B; with attention given to the development and use of mathematical models in epidemiology and to application of more advanced statistical methods to population problems in disease.

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 diseases 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 211A and 210A. 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 these data.

211C. Applied Epidemiology III (5) III. The Staff (Meyer in charge)

Laboratory—15 hours. Prerequisite: courses 211B and 210B. 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 human 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. Bankowski

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.

219. Avian Medicine (1) III. Adler

Lecture—1 hour. Prerequisite: Junior standing in the school of Veterinary Medicine or consent of instructor. Etiology, pathology, diagnosis, epidemiology, prevention and control of diseases of poultry, including those important to public health.

220. Advanced Avian Medicine (4) III. Adler

Lecture—3 hours; laboratory—3 hours. Prerequisite: enrollment in MPVM program, senior standing in School of Veterinary Medicine or consent of instructor. Prevention and control of the major diseases of domestic poultry.

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.

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.)

295. Preventive Avian Medical Practice (3) I, II, III. The Staff (McCapes in charge)

Laboratory—8 hours. Prerequisite: enrollment in avian medicine option of MPVM program or consent of instructor. Clinical instruction in avian medicine in which students apply knowledge from veterinary medicine and avian husbandry in the diagnosis, prevention and eradication of disease processes in domestic poultry populations. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Laboratory—8 hours. Prerequisite: enrollment in avian medicine option of MPVM program or consent of instructor. Clinical instruction in avian medicine in which students apply knowledge from veterinary medicine and avian husbandry in the diagnosis, prevention and eradication of disease processes in domestic poultry populations. May be repeated for credit.

299. Research (1-9) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

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 government 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. Equal or more comprehensive courses will be accepted.)

	UNITS
Preparatory Subject Matter	65
Biochemistry (Biochemistry 101A, 101B)	6
Biology (Biological Sciences 1)	5
Chemistry (Chemistry 1A, 1B, 1C, 5, 8A, 8B)	25
Mathematics (Mathematics 13 or Agricultural Science and Management 150, Mathematics 16A, 16B)	10
Microbiology (Bacteriology 2, 3)	5
Physics (Physics 2A and 2B or 2C)	6
Written or oral expression (English 1, 2, 5F, 5P, and/or Rhetoric 1)	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, 235; Biochemistry 101L, 123, 123L; Bacteriology 105, 106, 130A-130B-130L, 150, 150L, 230, 250; Environmental Toxicology 138; Epidemiology and Preventive Medicine 150; Water Science 120; Chemistry 130.	
Restricted Electives	30
Selected according to student's educational goal and upon approval of adviser.	

Family Practice

See Medicine

Food Biochemistry; Food Science; Food Science and Technology

Breadth Subject Matter	25
Social sciences and humanities or others as approved by adviser.†	
Unrestricted Electives	20
Total Units for the Major	180

Major Adviser. C. S. Ough (*Viticulture and Enology*).

Graduate Study. See page 101 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. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

Preparatory Subject Matter	UNITS 78-83
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 13, 29, 22A, 22B, 22C)	12
Microbiology (Bacteriology 2 and 3; Botany 2 or Zoology 2 may be substituted)	5-6
Physics, any course except Physics 10 and including at least one laboratory course (Physics 2A-2B-2C and 3A-3B-3C or 4A-4B-4C)	10
English	8

NOTE: For key to footnote symbols, see page 132.

Depth Subject Matter	27
Food Science and Technology, including 103, 113, and 125	
Biochemistry 123, 123L	4
Breadth Subject Matter	22
Social sciences and humanities, including 4 units of rhetoric†	
22	
Restricted Electives	28
Three upper division courses from biochemistry, plant or animal physiology, and bacteriology (e.g., Biochemistry 122, 153; Physiology 100A, 100B; Bacteriology 130A-130B; Food Science and Technology 104) and two upper division courses from environmental toxicology, public health, and nutrition	
15	
Other courses in area of food biochemistry	
13	
Unrestricted Electives	20-25
Total Units for the Major	180

Major Adviser. M. Mazelis (*Food Science and Technology*).

Graduate Study. See page 101.

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. Equal or more comprehensive courses are acceptable.)

Preparatory Subject Matter	UNITS 61
Biology and microbiology (Biological Sciences 1, Bacteriology 2, 3)	10

Chemistry and biochemistry (Chemistry 1A-1B-1C or 4A-4B-4C; 8A-8B; Biochemistry 101A, 101B)	27
Mathematics and physics (Mathematics 13, 19; Physics 2A, 2B, 2C)	16
Written or oral expression (choose from English 1, 2, 5F, 5P and/or Rhetoric 1)	8
Depth Subject Matter	28
Food science (Food Science and Technology 1, 49, 103, 104, 104L, 105, 110A, 111, 131)	
28	
Breadth Subject Matter	28
Social sciences and humanities electives†	
28	
Restricted Electives	38
Selected in accordance with student's educational goal and upon approval of adviser.	
Unrestricted Electives	25
Total Units for the Major	180

Major Adviser. R. A. Bernhard (*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 101 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

Richard A. Bernhard, Ph.D., Professor
 A. Wade Brant, Ph.D., Lecturer
 W. Duane Brown, Ph.D., Professor
 Christine M. Bruhn, M.S., Lecturer
 John Bruhn, Ph.D., Lecturer
 Paul A. Carroad, Ph.D., Assistant Professor
 Edwin B. Collins, Ph.D., Professor
 Walter L. Dunkley, Ph.D., Professor
 Robert E. Feeney, Ph.D., Professor
 Dieter W. Gruenwedel, Ph.D., Associate Professor
 Jerald M. Henderson, D.Engr., Professor
 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., Associate Professor
 Martin W. Miller, Ph.D., Professor
 Emil M. Mrak, Ph.D., Professor (*Emeritus*)
 2,* Thomas A. Nickerson, Ph.D., Professor

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Food Science and Technology

Harold S. Olcott, Ph.D., 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
Gerald F. Russell, Ph.D., Associate Professor
Bernard S. Schweigert, Ph.D., Professor
R. Paul Singh, Ph.D., Assistant Professor
J.M. Smith, Sc.D., Professor
¹Lloyd 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 (page 211); and page 101 for graduate study.

Related Courses. See courses in Biochemistry and Biophysics, Consumer Science, Nutrition, and Viticulture and Enology; Engineering 110, 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, Jennings, Schweigert; II, Jennings

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.

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. (Same course as Nutrition 93.) (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Schweigert in charge)
(P/NP grading only.)

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.

100AL. Principles of Food Composition and Properties Laboratory (2) I, Bruhn

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.

100B. Principles of Food Composition and Properties (3) II, Mazelis

Lecture—3 hours. Prerequisite: Chemistry 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.

100BL. Principles of Food Composition and Properties Laboratory (2) II, Bruhn

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, Collins

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. Microbiological techniques used in studying the characteristics of beneficial, harmful, and undesirable microorganisms associated with foods.

105. Microbiological Analysis of Foods (3) III.

Lecture—1 hour; laboratory—5 hours. Prerequisite: courses 104, 104L. Cultural and morphological characteristics of specific groups of bacteria and fungi involved in production or deterioration of foods. Analyses of microbiological quality of foods and food products.

106. Industrial Fermentations (3) I, Lewis, Phaff, Kunkee (Viticulture and Enology)

Lecture—3 hours. Prerequisite: Bacteriology 2. Microorganisms and their activity in relation to industrial processes such as baking, brewing, and the production of industrial solvents, vitamins, enzymes, and drugs. For laboratory experience in this field, students may register in course 106L.

***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, Schultz (Textiles and Clothing), Noble (Viticulture and Enology)

Lecture—3 hours. Prerequisite: course 1 or Viticulture and Enology 3 or the equivalent. Nature of sensory responses with emphasis on taste, odor and texture of foods; methodology of analytical laboratory analyses and consumer acceptance; correlation of sensory with chemical and instrumental measurements.

107L. Principles of Sensory Evaluation of Foods Laboratory (2) II, Pangborn

Discussion—1 hour; laboratory—3 hours. Prerequisite: Mathematics 13 and competence in applied statistics, through analysis of variance; 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 (4) I, Merson

Lecture—3 hours; discussion—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, heat and mass transfer, and problem solving.

110B. Heat Transfer in Food Processing (2) II, Singh

Lecture—2 hours. Prerequisite: course 110A or the equivalent. Conduction, convection, radiation, principles of refrigeration, heat exchangers.

111. Introduction to Food Processing (4) I, Miller, Nickerson

Lecture—3 hours; discussion-demonstration—2 hours. Prerequisite: Bacteriology 2, Chemistry 8A-8B, and Physics 2A-2B, or their equivalents. 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.

112. Comparative Aspects of Food Habits and Culture (4) I, Grivetti (Nutrition)

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Anthropology 2 or Geography 2. Intercomparison of cultural, geographical, socio-economical, religious and psychological influences on development and maintenance of food habits of past and present cultural groups.

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.

119. Principles of Dairy Processing (4) III, Nickerson, 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, Peterson (Avian Sciences) and staff

Lecture—2 hours; demonstrations (occasional). Prerequisite: Biochemistry 101B and Bacteriology 2 or the equivalent. Biochemistry, 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, marine foods, and sausages.

121. Birds and Their Eggs as Food (3) I, Peterson (Avian Sciences), 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.

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) III. Nickerson, 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 materials and properties. Public health problems associated with packaging. Food-packaging interactions for major commodities and their control.

150. Thermal Processing of Foods (2) III. Merson, Leonard

Lecture—1 hour; laboratory—3 hours. Prerequisite: courses 104 and 110B or consent of instructor. Theory and practical considerations of thermal processes such as canning, pasteurization and aseptic processing. Process calculations of microbial inactivation and chemical changes to safeguard public health, nutrition, and consumer acceptance. Operation and engineering analysis of retorts and heat exchangers.

160. Food Chemistry (4) III. Bernhard, Gruenwedel
Lecture—4 hours. Prerequisite: Chemistry 8B (or the equivalent); Biochemistry 101A, 101B recommended; or consent of instructor. The important classes of food constituents (water, carbohydrates, proteins, lipids, pigments, flavor and aroma constituents, toxins, etc.), their nature, occurrence, and chemical and biochemical significance in foods.

190. Senior Seminar (1) I, Schweigert, Nickerson
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.

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) II. 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 or consent of instructor. Morphology and physiology of fungi associated with food. Desirable activities of fungi: food fermentations, single-cell protein production, mushroom culture. Undesirable activities: preharvest and postharvest deterioration, food spoilage and preservation, toxin production.

250. 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. Dunkley
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 171). 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 Restricted 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 College Office, 228 Mrak Hall.

Upper Division Courses

120. Principles of Quantity Food Production (3) III. Prophet

Lecture—3 hours. Prerequisite: Food Science and Technology 100B and 100BL. 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 (Zeman 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.

198. Directed Group Study (1-5) I, II, III. The Staff (Zeman in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Zeman in charge)
(P/NP grading only.)

FOREIGN 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.

Classics

139B. Greek Literature in Translation.

141. Greek and Roman Comedy.

Comparative Literature

10A-L. Masterpieces of World Literature

40. Introduction to Comparative Literature.

49. Freshman Seminar: the Limits of Literary Communication.

50. Intermediate Seminar: Myths and Motifs.

51. Intermediate Seminar: Form and Fantasy.

52A-52B. Intermediate Seminar: The Orient and the West.

159A-G. Special Topics in Comparative Literature.

French

- 160A. The Modern Novel.
- 160B. The Modern Drama.
- 161A-D. Varieties in Authorial Vision.
- 162A-F. The Theory and Practice of Literary Translation.
- 163A-E. Literature and the Other Arts.
- 164A-C. The Great Periods of International Culture.
- 165. Studies in Fantastic Reality.
- 166A-I. Longer Narrative Forms: The Epic and the Novel.
- 167. Comparative Study of Major Authors.
- 168A-E. Modern Literary Movements and Styles.
- 169A-D. 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

- 39C. French Literature in English Translation: the Contemporary Period.
- 121. Twentieth-Century Novel.
- 122. Twentieth-Century Novel.
- 150. Masterpieces of French Literature.

German

- 15. The Development of German Literature.
- 49. Freshman Seminar.
- 50. The German Literary Heritage: Prose.
- 51. The German Literary Heritage: Drama.
- 112. Thomas Mann.
- 113. Hermann Hesse.
- 114. Goethe's *Faust*.
- 115. German Literature of the Twentieth Century.
- 116. Literary Aspects of Schopenhauer and Nietzsche.
- 117. Kafka.
- 118. Brecht.
- 121. Older German Literature in English Translation.
- 122. Older German Literature in English Translation.

Italian

- 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.
- 40. Survey of Russian Literature to 1800.
- 41. Survey of Nineteenth-Century Russian Literature.
- 42. Survey of Twentieth-Century Russian Literature.
- 121. The Nineteenth-Century Russian Novel.
- 123. The Twentieth-Century Russian Novel.
- 124. History of Russian Literary and Social Criticism.
- 126. The Russian Theater.
- 128. Modern Russian Poets.
- 140. Dostoevsky.
- 141. Tolstoy.
- 150. Russian Culture.
- 154. Russian Folklore.

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.

French

(College of Letters and Science)

Max Bach, Ph.D., Chairperson of the Department
Department Office (French and Italian), 515 Sproul
Hall

Faculty

Claude K. Abraham, Ph.D., Professor
Max Bach, Ph.D., Professor
Jean Marc Blanchard, Agrégé de Lettres,
Associate Professor
Edward M. Bloomberg, Ph.D., Associate Professor
Ruby Cohn, Ph.D., Professor (*Comparative
Literature, Dramatic Art*)
Gerald Herman, Ph.D., Associate Professor
Larry H. Hillman, Ph.D., Assistant Professor
Jurate Izokaitis, Ph.D., Assistant Professor
Margo R. Kaufman, M.A., Lecturer
Manfred Kusch, Ph.D., Assistant Professor
Marshall Lindsay, Ph.D., Professor
Nicole A. D. Marzac, Docteur ès Lettres, Professor
Ruth B. York, Ph.D., Lecturer

The Major Program

A Bachelor of Arts degree in French can lead to careers in business, civil service, library science, education, journalism, law, or health education. The major program is intended to train students in all four of the language skills (reading, writing, speaking, understanding) as well as in French literature and civilization. Students majoring in

French may choose a course of study from Plan A, emphasis on literature, or Plan B, emphasis on language. Those wishing to do graduate work in French are advised to select Plan A. Potential majors should seek the counsel of a departmental adviser as soon as possible.

French

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter (for Plan A and Plan B).....	16-39
French 1, 2, 3, 4 (or the equivalent).....	0-23
French 6, 30A, 30B, 45.....	16
Depth Subject Matter—Plan A, Emphasis on Literature	36
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 lan- guage or literature.....	8
Total Units for the Major (Literature Emphasis)	52-75

Depth Subject Matter—Plan B, Emphasis on Language	38
French 104, 105, 107A, 107B, 110, 138, 159, 160... ..	30
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 (Language Emphasis)	54-77

Recommended

French 108A, 108B; French 107A, 107B and 160 for students interested in obtaining a "single subject" teaching credential in California.

Teaching Credential Subject Representative. R. B. York. See page 107 for Teacher Education Program.

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D., degrees in French. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of French and Italian.

COURSES IN FRENCH

Lower Division Courses

A course may not ordinarily be taken for credit if it is a prerequisite to a course already completed. 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.

Not open for credit to students who have completed the first two years of high school French.

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.

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
Lecture—4 hours. Prerequisite: course 4 or the equivalent.
Reading of selected literary texts with emphasis on problems of syntax and 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. (P/NP grading only.)

8B. French Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 4. Practice in speaking French. (P/NP grading only.)

20. Fiction of Camus (2) II. York
Lecture—1 hour; discussion—1 hour. Study of the novels and short stories, their literary qualities and their relationship to the ideas expressed in the major essays. Readings and discussion in English. May not be counted toward the major in French.

21. Absurdist Playwrights in France (2) I. York
Lecture—1 hour; discussion—1 hour. A study of selected plays of Ionesco, Beckett, Adamov and Genet. Readings and discussion in English. May not be counted toward the major in French.

30A. Advanced Grammar (4) I, II, III. The Staff
Lecture—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—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 (Chairperson 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.

***39C. French Literature in English Translation: the Contemporary Period** (4) I, Izokaitis
Lecture—3 hours. Knowledge of French not required. Introduction to French literature for non-French majors.

45. Introduction to French Literature (4) I, II, III. The Staff
Lecture—3 hours; short papers. Prerequisite: course 6 or equivalent. Selected themes in French literature.

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—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—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) II. Marzac
Lecture—4 hours; term paper or oral presentation. Prerequisite: course 6. From the origins of French civilization through the sixteenth century.

107B. Survey of French Culture and Institutions (4) III. Kusch
Lecture—4 hours; term paper or oral presentation. Prerequisite: course 6. From the seventeenth century to the present.

108A. Advanced French Conversation (2) I, II, III. 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. (P/NP grading only.)

108B. Advanced French Conversation (2) I, 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. (P/NP grading only.)

110. Advanced Problems in Language and Style (4) III. Abraham
Lecture—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 6. *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) II. Herman
Lecture—3 hours; term paper. Prerequisite: course 6 or the equivalent. Study of the didactic, and satiric or popular literature of the twelfth and thirteenth centuries. 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. Marzac
Lecture—3 hours; term paper. Prerequisite: course 6. Study of the lyric poetry of the sixteenth century from Marot to d'Aubigné, with emphasis on the *Pléiade*.

116B. Literature of the Sixteenth Century (4) II. Marzac
Lecture—3 hours; term paper. Prerequisite: course 6. Rabelais and Montaigne. Critical study of the works in relationship to the period.

***117A. Theater of the Seventeenth Century** (4) II. Bloomberg
Lecture—3 hours; term paper. Prerequisite: course 6.

117B. Moralists of the Seventeenth Century (4) II. Bloomberg
Lecture—3 hours; term paper. Prerequisite: course 6.

***117C. Poetry and the Novel in the Seventeenth Century** (4) III. Izokaitis
Lecture—3 hours; term paper. Prerequisite: course 6.

118A. "Les Philosophes" (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 6. Readings from Montesquieu, Voltaire, Diderot, Rousseau and the *Encyclopédie*.

118B. The Novel in the Eighteenth Century (4) I, Blanchard
Lecture—3 hours; term paper. Prerequisite: course 6. Novels of Lesage, Prévost, Diderot, Rousseau, Laclos, Sade.

***118C. The Theater in the Eighteenth Century** (4) II. Kusch
Lecture—3 hours; term paper. Prerequisite: course 6. Plays of Marivaux and Beaumarchais.

***119A. The Nineteenth Century** (4) II. Bach
Lecture—3 hours; term paper. Prerequisite: course 6. Romanticism in the drama and novel.

119B. The Nineteenth Century (4) I, Blanchard
Lecture—3 hours; term paper. Prerequisite: course 6. Realism and naturalism: Balzac, Flaubert, Maupassant, Zola.

***119C. The Nineteenth Century** (4) II. Blanchard
Lecture—3 hours; term paper. Prerequisite: course 6 or the equivalent. Poetry from the Pre-Romantics to Baudelaire.

***119D. The Nineteenth Century** (4) I, Izokaitis
Lecture—3 hours; term paper. Prerequisite: course 6 or the equivalent. Symbolism: the poetry and poetics of Baudelaire, Mallarmé, Verlaine, Rimbaud, Corbière, Laforgue, and Lautréamont.

***120A. Twentieth-Century Drama** (4) I, York
Lecture—3 hours. Prerequisite: course 6. Representative plays from Jarry to Giraudoux.

120B. Twentieth-Century Drama (4) II. York
Lecture—3 hours. Prerequisite: course 6. Representative plays from Anouilh to Ionesco.

***121. Twentieth-Century Novel** (4) I, Lindsay
Lecture—3 hours; term paper. Prerequisite: course 6. Gide and Proust.

***122. Twentieth-Century Novel** (4) III. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 6. From Malraux to the Nouveau Roman.

123. Twentieth-Century Poetry (4) III. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 6 or the equivalent. Selected poetic texts from Apollinaire to the present.

***130. Critical Reading of Poetry** (4) I, Lindsay
Lecture—3 hours. Prerequisite: course 6 or the equivalent. 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 6 or the equivalent. 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) II. York
Lecture—3 hours. Prerequisite: course 6 or the equivalent. Analysis and evaluation of plays representing main types of French drama, with emphasis on dramatic structure and techniques.

138. Problems in French Composition and Syntax (4) III. Bloomberg
Lecture—3 hours; term paper. Prerequisite: course 110. 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 6. May be repeated for credit with consent of instructor.

***150. Masterpieces of French Literature** (4) I, Lindsay
Lecture—3 hours; term paper. Prerequisite: English 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 (2) II. Hillman
Lecture—2 hours; laboratory—1 hour. Prerequisite: 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. Hillman
Lecture—3 hours; term paper. Prerequisite: course 6 or consent of instructor; course 159 recommended. Linguistic analysis of modern French.

French

197T. Tutoring in French (2-4) I, II, III. The Staff Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of chairperson. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

197TC. Tutoring in the Community (2-4) I, II, III. The Staff Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of Chairperson. Tutoring in public schools under the guidance of a regular teacher and supervision by a departmental faculty member. May be repeated for credit for a total of 6 units (P/NP grading only.)

198. Directed Group Study (1-4) 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, Kusch 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, Kusch 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, Hillman Seminar—3 hours. Examination of earliest documents tracing 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, Hillman Seminar—3 hours. Evolution of Modern French from the Renaissance to the present, with emphasis on the relationship between language and literature and the influence of grammarians.

***202A. Medieval French Literature: The Epic Tradition** (4) I, 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. Offered in odd-numbered years.

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 studied. Offered in even-numbered years.

***202C. Medieval French Literature: Theater** (4) II, The Staff Seminar—3 hours. Study of French theater from its liturgical origins to fifteenth century *farces* and *soties*. May be repeated for credit when different topic studied. Offered every third year.

***202D. Medieval Literature: Allegory** (4) III, Herman Seminar—3 hours; term paper. Prerequisite: graduate standing. A study of medieval allegory as an art form, with particular emphasis on Guillaume de Lorris' and Jean de Meung's *Roman de la Rose*. Readings in Old French.

***203. Reading of Old French Texts** (4) III, Hillman Seminar—3 hours. Prerequisite: course 201A-201B or the equivalent.

***204A. Fifteenth-Century Literature: Historians** (4) I, Marzac Seminar—3 hours. The historical scene of the period through the writings of its main memorialists, Commynes,

Bouchet, la Marche, Chastellain, with special attention given to their literary and artistic achievements. May be repeated for credit when different topic is studied. Offered every third year.

***204B. Fifteenth-Century Literature: Poetry** (4) II, Marzac Seminar—3 hours. The poetic achievements of noblemen and rascals. New attitudes towards, and functions of poetry studied in Charles d'Orléans, Christine de Pisan, Alain Chartier, and Villon. Choice of topic will vary. May be repeated for credit. Offered every third year.

***204C. Fifteenth-Century Literature: Nouvelles** (4) III, Marzac Seminar—3 hours. An age of liberation portrayed in historical, satirical, and sociological *nouvelles*. Special study of the works of LaSalle and Jehan de Paris. May be repeated for credit when different topic is studied. Offered every third year.

***204D. Fifteenth-Century Paleography** (4) II, Marzac Seminar—3 hours. Principles and techniques in French paleography. Study and critical edition of hitherto unknown texts in manuscript form. May be repeated for credit when different topic is studied. Offered in odd-numbered years.

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. Offered in even-numbered years.

***205B. Sixteenth-Century Literature: Pre-Renaissance and Renaissance Poets** (4) I, Marzac Seminar—3 hours. The poetry of the *École lyonnaise* and of the *Pléiade*. May be repeated for credit when different topic studied. Offered every third year.

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. Offered in even-numbered years.

206B. Seventeenth-Century Literature: Moralists (4) II, Bloomberg Seminar—3 hours. Works of Méré, Descartes, Mme. de Sévigné, Pascal, La Rochefoucauld, La Bruyère, et al. One or more authors may be covered. May be repeated for credit with consent of instructor when different topics are studied. Offered in even-numbered years.

***206C. Seventeenth-Century Literature: Novel** (4) III, The Staff Seminar—3 hours. Studies of works of one or more novelists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered every third year.

206D. Seventeenth-Century Literature: Poetry (4) III, Abraham Seminar—3 hours. Studies of the works of one or more poets of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered every third year.

***207A. Eighteenth-Century Literature: Theater** (4) II, The Staff Seminar—3 hours. Study of one or more dramatists of the period. Examination of the new theater in the context of a changing society. Analysis of the distinctive characteristics of new genres. May be repeated for credit when different topic is studied. Offered every third year.

***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. Offered in even-numbered years.

***207C. Eighteenth-Century Literature: "Philosophes"** (4) III, The Staff Seminar—3 hours. 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 when different topics are studied. Offered in even-numbered years.

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. Offered in even-numbered years.

***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. Offered every third year.

***208C. Nineteenth-Century Literature: Poetry** (4) II, Lindsay; III, Izokaitis 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. Offered in odd-numbered years.

209A. Twentieth-Century Literature: Fiction (4) II, Lindsay Seminar—3 hours. Study of the works of one or several novelists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in odd-numbered years.

***209B. Twentieth-Century Literature: Essays** (4) III, The Staff Seminar—3 hours. Study of the works of one or several essayists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered every third year.

***209C. Twentieth-Century Literature: Theater** (4) III, Cohn Seminar—3 hours. Study of the works of one or several dramatists of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in even-numbered years.

***209D. Twentieth-Century Literature: Poetry** (4) II, The Staff 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. Offered in even-numbered years.

***210. Studies of Narrative Fiction** (4) III, The Staff Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered in even-numbered years.

***211. Studies in Criticism** (4) III, Blanchard Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered every third year.

212. Studies in the Theater (4) I, Cohn Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered every third year.

***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. Offered every third year.

214. Study of a Literary Movement (4) I, Marzac Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied. Offered every third year.

***221. Structuralism** (4) II, Blanchard Lecture—3 hours; term paper. Sources and development of the structuralist movement. Cross cultural and interdisciplinary approach, with emphasis on language and literary theory. Lecture and discussion in English. Readings in French or English.

***230. Old Provençal** (4) III. Hillman
Seminar—3 hours. Prerequisite: course 201A or the equivalent. An introduction to Old Provençal phonology and morphology, with reading and interpretation of texts. Offered every third year.

***231. Studies in French Linguistics** (4) I, Hillman
Seminar—3 hours. Prerequisite: consent of instructor. May be repeated for credit with consent of instructor when different topic studied. Offered every third year.

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.

290A. Teaching of French in College (1) I, The Staff
Lecture-discussion—1 hour. 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.)

290B. Teaching of French in College (1) II. The Staff
Lecture-discussion—1 hour. 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.)

297. Individual Research (1-5) I, II, III. The Staff
(S/U grading only.)

298. Group Study (1-4) I, II, III. The Staff (Chairperson in charge)
Seminar—1-3 hours. May be repeated for credit with consent of instructor.

299. Research (2-12) 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. Teaching of a Modern Foreign Language (3) III. Kaufman
Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in a modern foreign language.

Genetics

(College of Agricultural and Environmental Sciences)

Paul E. Hansche, Ph.D., Chairperson of the Department
Department Office, 352 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., Associate Professor
Gordon J. Edlin, Ph.D., Professor
Kathleen M. Fisher, Ph.D., Associate Professor
Lila L. Gatlin, Ph.D., Lecturer
Leslie D. Gottlieb, Ph.D., Associate Professor
Melvin M. Green, Ph.D., Professor
Paul E. Hansche, Ph.D., Professor

Alex L. Kahler, Ph.D., Lecturer
John A. Kiger, Jr., Ph.D., Associate Professor
Timothy Prout, Ph.D., Professor
S. Richard Snow, Ph.D., Professor
G. Ledyard Stebbins, Ph.D., Professor (*Emeritus*)

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.

Genetics

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 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 102; Botany 2; Zoology 2	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 (Mathematics 13; 16A-16B-16C or 21A-21B-21C)	13-16
Depth Subject Matter	22-25
Biochemistry 101A-101B	6
Genetics 100A-100B-100L	7
Three additional courses in genetics	9-12
Breadth Subject Matter	
<i>College of Agricultural and Environmental Sciences students</i>	36
English and/or rhetoric	8
Social sciences and/or humanities†	28
<i>College of Letters and Science students</i>	
Refer to page 92 for a description of requirements to be completed in addition to the major.	
Restricted Electives	18-30
Six upper division courses in biological sciences or other fields relevant to genetics and related to student's interest, chosen with approval of adviser. (Recommended: one course in animal, plant, or microbial physiology; Mathematics 105A-105B or 130A-130B, or 131A-131B-131C)	18-30
Unrestricted Electives	24-27
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 requirement.

Major Adviser. P. E. Hansche.

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 101) and the *Announcement of the Graduate Division*.

Graduate Advisers. See *Class Schedule and Room Directory*.

Applied Genetics. See under Animal Genetics (page 142).

COURSES IN GENETICS

Questions pertaining to the following courses should be directed to the instructor or the Division of Biological Sciences, 150 Mrak Hall.

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 (Hansche in charge)
Prerequisite: consent of instructor. Individual study for undergraduates. (P/NP grading only.)

Upper Division Courses

100A. Principles of Genetics (3) I, Snow; II, Boyd
Lecture—3 hours; or autotutorial—2 hours and general assembly—1 hour. Prerequisite: Biological Sciences 1, and either Bacteriology 2, Botany 2, or Zoology 2. An introduction to genetics, covering the areas of molecular and biochemical, developmental, and classical genetics.

100B. Principles of Genetics (3) II, Hansche; III, Gottlieb
Lecture—3 hours; or autotutorial—2 hours and general assembly—1 hour. Prerequisite: course 100A; a knowledge of basic statistics recommended. Continuation of course 100A, covering topics of cytogenetics, quantitative, population, and evolutionary genetics.

100L. Principles of Genetics Laboratory (1) I, II, III. Green, Boyd
Laboratory—3 hours. Prerequisite: course 100A or 115, and Bacteriology 3. Laboratory work in basic genetics to supplement courses 100A, 100B, and 115. (P/NP grading only.)

101. Cytogenetics (3) III. Snow, Rick (Vegetable Crops)
Lecture—3 hours. Prerequisite: course 100B or 115. 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.

101L. Cytogenetics Laboratory (2) III. Snow, Rick (Vegetable Crops)
Laboratory—6 hours. Prerequisite: course 101 (may be taken concurrently). Laboratory study of chromosome structure and behavior.

102. Molecular and Biochemical Genetics (3) I, Edlin
Lecture—3 hours. Prerequisite: course 100A, 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 or 115. Evolutionary processes in higher organisms.

104. Developmental Genetics (4) II. Abbott (Avian Sciences), Kiger
Lecture—3 hours; discussion—1 hour. Prerequisite:

NOTE: For key to footnote symbols, see page 132.

Geography

course 100A or 115; 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 or 115; Mathematics 13 or 105 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 multilocus systems.

115. Human Genetics (5) I, Green

Lecture—4 hours; discussion—1 hour. Prerequisite: introductory course in zoology, botany, or biology; Mathematics 13, or the equivalent; upper division standing; not open for credit to students who have received credit in courses 100A-100B. Introduction to genetics with special emphasis on man. Course will fulfill the needs of preprofessional students and those in other areas of human biology.

120. General Genetics (4) I, II, III. The Staff (Hansche in charge)

Lecture—4 hours. Prerequisite: Biological Sciences 1; Mathematics 13 or the equivalent. This course is designed to provide a well-rounded treatment of the science of genetics for students in the biological sciences who require only a short course in general genetics.

197T. Tutoring in Genetics (1-5) I, II, III. The Staff (Hansche 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 (Hansche 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 (Hansche in charge)

Prerequisite: consent of instructor based on adequate preparation of the student in allied fields. (P/NP grading only.)

Graduate Courses

203. Advanced Evolution (3) III. Gottlieb

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 103 and 105 or consent of instructor. Analysis of the process of speciation in plants and animals. Offered in odd-numbered years.

205. Advanced Population Genetics (3) I.

Lecture—3 hours. Prerequisite: course 105, Mathematics 130A or 131A. Analysis of the genetic structure and evolution of populations. Offered in even-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.

291. Seminar in History of Genetics (2) II. Rick (Vegetable Crops)

Seminar—2 hours. Prerequisite: course 100B or 115. The development of modern genetic theories beginning with Mendel. (S/U grading only.)

292. Seminar in Gene Structure and Action (1-3) III. Boyd

Seminar—1-3 hours. Prerequisite: course 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.

Seminar—1-3 hours. Prerequisite: course 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 study the organic evolution. Offered in odd-numbered years. (S/U grading only.)

*294. Seminar in Populational, Ecological, and Behavioral Genetics (1-3) I.

Seminar—1-3 hours. Prerequisite: courses 103 and 105 or consent of instructor. Topics of current interest relating genetics to problems of populations, ecology, and behavior. Offered in odd-numbered years. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Hansche 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. The Staff (Hansche in charge)

(S/U grading only)

Geography

(College of Letters and Science)

Frederick J. Simoons, 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
David M. Helgren, Ph.D., Assistant Professor
Stephen C. Jett, Ph.D., Associate 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 subfields—physical, cultural, or urban-economic—supplemented by related courses in other departments. Programs are planned in consultation with the major adviser.

Geography's approach is academic, but provides background for students interested in careers in teaching, planning, and international affairs.

Geography

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	19
Geography 1, 2, 3, 5, 6 or 7	19
Depth Subject Matter	36
One course from each of the following categories . . .	16
a. Physical: Geography 108, 111, 112, 119, 162	
b. Cultural: Geography 143, 152, 170, 171, 172, 173	
c. Economic-Urban: Geography 141, 142, 154, 155, 156, 161	

d. Regional: Geography 121, 122A, 122B, 123A, 123B, 124, 125A, 125B, 126, 131

One course from each of two of the following categories

- a. Geography 102, 103, 104, 106
- b. Geography 105
- c. Geography 110

Geography 151

Eight additional upper division units in Geography

Total Units for the Major 55

Major Adviser. See *Class Schedule and Room Directory*.

Teaching Credential Subject Representative. D. J. Dingemans. See page 107 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, Helgren; II, Shelton; III, Helgren

Lecture—3 hours; laboratory—2 hours. Basic physical elements of the human habitat, especially climate, landforms, soils, and natural vegetation.

2. Man in the Habitat: An Introduction to Cultural Geography (4) I, III. Simoons, Jett

Lecture—3 hours; discussion—1 hour. Major systems of habitat use; their characteristics, origins, spread, ecology; and impact of man's use on his habitat. Principal themes in cultural geography. Emphasis on the nonindustrial world.

3. Climate and Weather (3) I, III. Shelton

Lecture—3 hours. Composition and structure of atmosphere; weather elements: pressure, wind, temperature, moisture, fog, and clouds; weather maps; regional climates and world climate classification; instruments for obtaining climatological data; installation and maintenance of weather stations; evaluation of recordings.

4. Maps and Map Interpretation (3) I, Bahre

Lecture—3 hours. Properties and components of maps. Major classes of projections. Types of maps, emphasizing relief, cadastral, thematic, and modern trends in mapping. History and development of cartography.

5. Introduction to Urban and Economic Geography (4) I, II. Gregor

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) III. Shelton

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.

*11. Cultural Geography of Black America (4) II.

Lecture—4 hours. Geographic origins, dispersals, and adaptations of blacks in the New World.

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) II. Bahre
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 4 or consent of instructor. Compilation and generalization of base-map data; symbolization and processing of map data; cartographic design and lettering techniques; map reproduction.

106. Interpretation of Aerial Photographs (4) I. Bahre
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or consent of instructor. Analysis of landscape from aerial photographs: land forms; vegetation; land use; settlements; transport and communications. Preparation of contour and planimetric maps, and construction of aerial photo mosaics.

***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) I. Helgren
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Origin of land forms. Review of varied interpretations of processes involved, with emphasis on recent views.

110. Statistical Methods in Geographical Research (4) II. Dingemans
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 13 or the equivalent. Principles of statistical reasoning illustrated with examples from the field of geography. Critical review of current applications of statistical methods in geographical research.

***111. Alluvial Morphology** (4) II. Helgren
Lecture—3 hours; discussion—1 hour. Prerequisite: course 108 or consent of instructor. The origin and genesis of alluvial landforms, especially those of Quaternary age. Analysis of gradational processes giving rise to alluvial landforms, including tectonism, eustasy, and climatic change. Techniques of paleo-landscape identification: soil stratigraphy, paleohydrology, and radiometric dating.

112. Coastal Morphology (4) II. Helgren
Lecture—3 hours; discussion—1 hour. Prerequisite: course 108 or consent of instructor. Advanced treatment of coastal landforms and the processes that produce them.

119. Arid Lands (4) II. 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) III. 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) III. 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** (4) II. Thompson
Lecture—3 hours; term paper. 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) III. 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—3 hours; term paper. 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—3 hours; term paper. 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.

131. California (4) III. Gregor
Lecture—3 hours; discussion—1 hour. Regions of California; landforms, climate, and other physical characteristics; agricultural, mineral, and other resources; and patterns of settlement, population, transportation, and economy.

***141. Economic Geography** (4) I. Gregor
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Analysis of the economic regionalization of the earth and associated trade and transportation networks.

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) III. 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 set-

tlement patterns; theories of settlement systems. Emphasis on rural settlement features and non-western settlements.

155. Urban Geography (4) II. Dingemans
Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Geography of land use within cities. The processes of change, and theories of economic and social organization of urban space. The urban landscape as a product of history, planning policy, transportation 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 (4) I. Shelton
Lecture—3 hours; term paper. Prerequisite: course 1 or consent of instructor. 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) I. 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) III. Simoons
Lecture—3 hours; term paper. 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. Geography of Domesticated Animals** (4) II. Simoons
Lecture—3 hours; term paper. 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. Plants and Culture History (4) II. Bahre
Lecture—3 hours; term paper. Prerequisite: course 1 or 2 or consent of instructor. The cultural processes of adaptation, innovations, and diffusion in relation to plants and plant complexes in various geographic settings. Perception of the plant realm and the assignment of value and symbolic significance to plants.

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.

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.)

NOTE: For key to footnote symbols, see page 132.

Geology

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) II. Jett
Seminar—3 hours. Region to be announced annually.

291. Seminar in Cultural Geography (4) I, II. Simoons, Jett
Seminar—3 hours.

***292. Seminar in Landform Analysis** (4) II. Helgren
Seminar—3 hours.

***293. Seminar in Political Geography** (4) I.
Seminar—3 hours.

294. Seminar in Climatology (4) II. Shelton
Seminar—3 hours.

295. Seminar in Urban Geography (4) III. Dingemans
Seminar—3 hours.

***296. Seminar in Agricultural Geography** (4) I, Gregor
Seminar—3 hours.

***297. Seminar in Industrial Geography** (4) I, Gregor
Seminar—3 hours.

298. Group Study (2-5) I, II, III. The Staff
Prerequisite: consent of instructor.

299. Research (2-12) 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)

Richard Cowen, Ph.D., Chairperson of the
Department
Department Office, 175 Physics-Geology Building

Faculty

Gerard C. Bond, Ph.D., Assistant Professor
Richard Cowen, Ph.D., Associate Professor
Howard W. Day, Ph.D., Assistant Professor
Cordell Durrell, Ph.D., Professor
Harry W. Green II, Ph.D., Associate Professor
Charles G. Higgins, Ph.D., Professor
Jere H. Lipps, Ph.D., Professor
²Ian D. MacGregor, Ph.D., Professor
Robert A. Matthews, A.B., Lecturer
Eldridge M. Moores, Ph.D., Professor
Dennis R. Ojakangas, Ph.D., Lecturer
Wayne C. Shanks, Ph.D., Assistant Professor
Robert J. Twiss, Ph.D., Assistant Professor
James W. Valentine, Ph.D., Professor
Kenneth L. Verosub, Ph.D., Assistant Professor
Raymond W. Wittkopp, B.S., Lecturer

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	27-28
Biological Sciences 1 or 10	4-5
Chemistry 1A-1B or 4A-4B	10
Geology 60, 60L	5
Physics 2A, 3A, 2B, 3B	8
Depth Subject Matter	36
Geology 102, 103, 103L, 105, 105L, 106, 106L, 107, 107L	27
Additional upper division units in geology and related fields approved by the major adviser	9
Total Units for the Major	63-64

Recommended

Chemistry 1C or 4C; Geology 1, 1L, 2, 2L, 3, 3L;
Mathematics 13, 15, 16A, 16B.

Geology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	51-52
Biological Sciences 1 or 10	4-5
Chemistry 1A-1B-1C; or preferably, 4A-4B-4C	15
Geology 60, 60L	5
Mathematics 21A, 21B, 21C	12
One course from Mathematics 22A, 22B, 22C	3
Physics 4A, 4B, 4C	12
Depth Subject Matter	45
Geology 102, 103, 103L, 105, 105L, 106, 106L, 107, 107L, 118, 124A, 124B	43
Geology 190 (repeat course at least once)	2
Total Units for the Major	96-97

Recommended

Geology 1, 1L, 2, 2L, 3, 3L.

Geology

B.S. Major Requirements:

Paleobiology emphasis

	UNITS
Preparatory Subject Matter	56
Biological Sciences 1	5
Chemistry 1A-1B-1C; or preferably, 4A-4B-4C	15
Geology 60, 60L	5
Mathematics 15, 21A, 21B, 21C	17
Zoology 2	6
Physics 4A, 4B	8
Depth Subject Matter	45
Geology 102, 103, 103L, 105, 105L, 106, 106L, 107, 107L, 118	35
Geology 190 (repeat course at least once)	2
Additional upper division units in Geology and related fields appropriate to this specializa- tion and approved by the major adviser	8
Total Units for the Major	101

Recommended

Geology 1, 1L, 2, 2L, 3, 3L.

Major Advisers. C. G. Higgins (A.B. degrees);
and R.A. Matthews, K. L. Verosub (B.S. degrees).

Teaching Credential Subject Representative. C.
G. Higgins. See page 107 for the Teacher Educa-
tion Program.

Graduate Study. The Department of Geology of-
fers a program of study and research leading to
the M.S. and Ph.D. degrees. For information re-
garding graduate study in geology, address the
Graduate Adviser, Department of Geology.

Graduate Advisers. W. C. Shanks, J. W. Valen-
tine.

COURSES IN GEOLOGY

Lower Division Courses

1. Evolution of the Earth (3) I, Lipps; III, The Staff
Lecture—3 hours. Prerequisite: high school science. 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. Lipps
Laboratory—3 hours. Prerequisite: course 1 (concurrently).
The materials (rocks and minerals), structures (faults and
folds), and processes (sea floor spreading and continental
drift) that formed the Earth, illustrated by specimens, maps,
experiments, and field trips.

2. Landforms (3) III. 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) III. Higgins
Laboratory—3 hours. Prerequisite: courses 1L and 2 (prefer-
ably taken concurrently). How to study and interpret
landforms geologically; an introduction to some of the
geomorphologist's tools—maps, models, aerial photo-
graphs, 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 or-
ganisms from their fossil remains.

3L. History of Life Laboratory (1) II. Cowen
Laboratory—3 hours. Prerequisite: course 3 (concurrently);
course 25 recommended. Exercises in understanding fos-
sils as the clues to interpreting ancient life, including their
functional morphology, paleoecology, and evolution.

***16. The Physical Earth and Man** (3) III.
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 and other geologic hazards of Man, his structures, and his environment. Discussion of the causes, effects, and solution of geologic problems in rural and urban settings.

20. Geology of California (2) II, Matthews
Lecture—2 hours; demonstration—1 hour. Prerequisite: course 25 recommended. 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.

***25. Geologic Excursions** (2) I, The Staff
Lecture—1 hour; in the field—6 to 8 Saturdays. Prerequisite: course 1 (preferably taken concurrently). Study areas of geologic interest in the Sierra Nevada (gold-bearing gravels, glacial terrane, volcanic rocks) and Coast Ranges (old sea floor, folded sedimentary rocks, San Andreas fault) and appraisal of man's impact on the natural environment.

60. General Mineralogy (3) I, Green
Lecture—3 hours. Prerequisite: high school chemistry. Crystallography; physical and chemical structure and properties of minerals; mineral genesis.

60L. General Mineralogy Laboratory (2) I, Green
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, The Staff
Lecture—1 hour; laboratory—2 hours; field work—8 full days; final report. Prerequisite: courses 103L, 105L, and 106L. Introduction to geologic field study: tools, methods, geologic mapping, and preparation of reports.

103. General Petrology (3) II, Day
Lecture—3 hours. Prerequisite: course 60. Origin, nature, and classification of the principal rocks that comprise the crust of the Earth.

103L. General Petrology Laboratory (2) II, Day
Laboratory—6 hours. Prerequisite: courses 60, 60L, and 103 (preferably taken concurrently). Laboratory study of the principal rocks that comprise the crust of the Earth by methods applicable in the field.

105. Structure of the Earth (3) I, Green, Moores
Lecture—3 hours. Prerequisite: course 1 or consent of instructor. Structure of the Earth's interior: variation of seismic velocity, density, composition, and temperature with depth; isostasy; introduction to plate tectonics and continental drift; crustal deformation: faults and folds; examples of regional deformation with reference to plate tectonics.

105L. Structural Geology Laboratory (4) I, Green, Moores
Lecture—2 hours; laboratory—4 hours; two full-day field trips and reports. Prerequisite: course 105 (may be taken concurrently), and working knowledge of trigonometry; course 1L recommended. Graphic solutions to structural problems; interpretation of geologic maps; structure sections; introductions to field techniques, structural analysis, concepts of stress and strain, and their application in geology.

106. Ancient Environments (3) II, Bond
Lecture—3 hours. Prerequisite: course 1 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, Bond
Laboratory—6 hours; two or three one-day field trips. Prerequisite: course 106 (preferably taken concurrently), 105L or consent of instructor. 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, Valentine
Lecture—3 hours. Prerequisite: Biological Sciences 1. 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, Valentine
Laboratory—6 hours (including two all-day field trips). Prerequisite: Biological Sciences 1; course 107 (concurrently). Exercises in determining the ecological functions and evolution of individuals, populations, and communities of fossil organisms in field and laboratory.

111A. Paleobiology of Invertebrata (4) I, Cowen
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of the major phyla of invertebrates.

111B. Paleobiology of Protlsta (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. Evolution of stars and their bearing on the origin of elements. Origin and early history of the solar system and of the terrestrial planets and their satellites.

115. Geochemistry (3) II, Shanks
Lecture—3 hours. Prerequisite: Chemistry 1A (may be taken concurrently). 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.

116. The Oceans (3) II, Powell, (Environmental Studies), Cowen
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 4C 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 4C 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) (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) III, Moores, Wittkopp
Lecture—1 hour; laboratory—3 hours. Prerequisite: courses 60 and 60L. Introduction to the techniques used to identify opaque minerals.

124A. Optical Mineralogy (4) III, Green
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 60L; course 103L recommended. Optical properties of crystals and techniques of mineral identification with the petrographic microscope.

124B. Petrography (4) I, Moores, Bond, Day
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 103L and 124A. Use of the petrographic microscope in describing, classifying, and determining origin of igneous, sedimentary, and metamorphic rocks. Lecture emphasizes origin and distribution of major rock types; laboratory study of selected thin sections.

125. Igneous Petrology (4) II, MacGregor
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124B 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) I, Bond
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: courses 106 and 106L or consent of instructor; course 124B 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) III, Day
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124B 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, non-metallic, 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) I.
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 geologic age determinations.

150A. Physical and Chemical Oceanography (4) I, Powell
Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 or Environmental Studies 116; Physics 4B; 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. Geology of the Oceans (3) II, Bond, Moores
Lecture—3 hours. Prerequisite: courses 60, 60L, 105, or consent of instructor. 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, Richerson, Valentine
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

German

research will be equally stressed. A portion of the course will be devoted to man's use of land impact on the ocean. (Same course as Environmental Studies 150C.)

152. Photogeology and Remote Sensing (4) II. Higgins
Lecture—2 hours; laboratory—6 hours. Prerequisite: Stereoscopic vision and course 1L or 2L; courses 103 and 150 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 (3) I, Higgins
Lecture—3 hours. Prerequisite: course 2 or Geography 1; courses 1L and 2L recommended. The processes that shape the Earth's surface and how they work. An introduction to geomorphic observation and theory.

160. Global Tectonics (3) III. Moores
Lecture—3 hours. Prerequisite: course 105 or consent of instructor. Major tectonic features of the Earth. Causes, processes, and consequences of plate motions through geologic time; plate tectonic model of orogenesis.

***162. Stress and Deformation** (4) III. Moores
Lecture—3 hours; discussion—2 hours. Prerequisite: Mathematics 21C and Physics 4B; Mathematics 22A, 22C, and Physics 4C 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) III. Shanks
Lecture—3 hours; laboratory—2 hours. Prerequisite: courses 103 and 105L. Examination of major metallic ore-types using principles of plate tectonics, structural geology, petrology, and geochemistry. Laboratory study of selected ore deposits.

***175. Introduction to Geological Engineering** (3) III. Shen, 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) II. Shanks
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) II. Ojakan-gas
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.

190. Seminar in Geology (1) I, II, III. The Staff
Discussion—1 hour; seminar—1 hour. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: senior standing in geology or consent of instructor.

199. Special Study for Advanced Undergraduates (1-4) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Advanced Biological Ecology (4) II. Salt, Major, Valentine
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. (Same course as Botany 201, Ecology 201, and Zoology 201.)

206. Stratigraphic Analysis (3) I, Bond
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-dispositional models.

209. Origin and Significance of Metamorphic Textures (4) III. 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.

216. Tectonics (3) II. Moores
Seminar—3 hours. Prerequisite: course 160 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 odd-numbered years.

226. Advanced Sedimentation and Sedimentary Petrology (4) I, Bond
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.

***236. Physical Geology of California** (2) I, II, III. Durrell
Seminar—2 hours.

250. Advanced Geochemistry Seminar (3) III. Shanks
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) I, 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
Seminar—3 hours. Prerequisite: course 124B; courses 125, 254 recommended. Physicochemical principles of

metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks.

260. Paleontology (3) II. Valentine
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.

261. Paleocoenology (3) I, Valentine
Lecture—2 hours; seminar—1 hour. Prerequisite: course 107 and Mathematics 15. Recommended: Mathematics 13. Theoretical and operational analyses of the structure and evolution of ancient and modern biotic associations, chiefly marine.

***262. Paleosystematics** (3) I, Valentine
Lecture—1 hour; seminar—2 hours. Prerequisite: course 107, Mathematics 15. Recommended: Genetics 100B, Mathematics 13. Principles and methods of taxonomy of fossil organisms.

263. Functional Morphology of Fossil Invertebrates (4) II. 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) III. Lipps
Seminar—3 hours. Prerequisite: course 111B or Zoology 110 or Bacteriology 150. Analysis and discussion of selected topics on the evolution of single-celled organisms with emphasis on their fossil record and biology.

280. Igneous Petrology (3) III. MacGregor
Seminar—2 hours; laboratory—3 hours. Prerequisite: course 124B. Integrated laboratory, field study, and seminar on igneous processes and products.

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. (SU 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)
(SU grading only.)

German

(College of Letters and Science)

Valerie A. Tumins, Ph.D., Chairperson of the Department

John F. Fetzner, Ph.D., Vice-Chairperson of the Department

Department Office (German and Russian), 416 Sproul Hall

Faculty

Wilbur A. Benware, Ph.D., Assistant Professor

*Clifford A. Bernd, Ph.D., Professor

William M. Estabrook, Ph.D., Lecturer

John F. Fetzner, Ph.D., Professor

Roland W. Hoermann, Ph.D., Associate Professor

Karl R. Menges, Ph.D., Assistant Professor

Wolfgang W. Moelleken, Ph.D., Professor

*² H. Guenther Nerjes, Ph.D., Associate Professor

Fritz Sarnem-Frankeneegg, Ph.D., Assistant Professor

Peter M. Schaeffer, Ph.D., Assistant Professor

The Major Program

This major explores in depth the language, the literary movements, and the cultural trends in the German-speaking world which have greatly influenced the destiny of Europe. This exploration may be an end in itself, the principal experience being a humanistic education leading to the Bachelor of Arts degree. The German major opens career opportunities in teaching and research, and forms an important adjunct to such fields as international relations, the sciences, and the arts. Finally, it offers excellent preparation for advanced study at the graduate level leading to the M.A. and Ph.D. degrees.

German

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	4-22
German 1 or 1AT, 2 or 2AT, 3 (or the equivalent) .	0-18
German 4 or 6A-6B	4
Depth Subject Matter	36
German 101, 102, 103, 119A, 119B	20
Additional upper division units in German, excluding courses in translation	16
Total Units for the Major	40-58

Major Adviser. J. F. Fetzer.

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 97.

Teaching Credential Subject Representative. W. M. Estabrook. See page 107 for the Teacher Education Program.

The Master of Arts Degree. The Department offers programs of study leading to the M.A. degrees. 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 Advisers. C. A. Bernd, P. M. Schaeffer

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. Not open for credit to students who have completed the first two years of high school German.

1ATA-1ATB-1ATC. Individualized German (2-2-2) I, II, III. Estabrook
Students participate in group lectures and individual discussions with instructor(s). The three segments of German 1AT correspond to course 1. Instruction is on an individual basis. Students may start at any point. Placement advising is available.

2. Elementary German (6) I, II, III. Estabrook
Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 1.

NOTE: For key to footnote symbols, see page 132.

2ATA-2ATB-2ATC. Individualized German (2-2-2) I, II, III. Estabrook

Students participate in group lectures and individual discussions with instructor(s). Prerequisite: course 1AT (or the equivalent). The three segments of German 2AT correspond to course 2. Instruction is on an individual basis. Students may start at any point. Placement advising is available.

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. Bernd
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. (Course 6A may be taken concurrently with 4 and/or 6B.) 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. (Course 6B may be taken concurrently with 4 and/or 6A.) 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
Lecture—1 hour; discussion—2 hours; translation project. Prerequisite: sophomore standing. Intensive course for non-majors to provide intermediate 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. (P/NP grading 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.)

15. The Development of German Literature (4) I, III. The Staff
Lecture—3 hours. Characteristic themes, problems, and genres in the mainstream of German literature, from medieval epics and love poetry to the modern period. Study of masterworks in English translation demonstrating problem continuity and relevance to contemporary values within the total intellectual framework.

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. The German Literary Heritage: Prose (2) II. The Staff (Chairperson in charge)
Discussion—2 hours. Introduction to selected major prose works of German literature and their impact on the European tradition. Text in English translation. Not for majors.

51. The German Literary Heritage: Drama (2) III. The Staff (Chairperson in charge)
Discussion—2 hours. Introduction to selected major dramas of German literature and their impact on the European traditions. Text in English translation. Not for majors.

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.

104. German Grammar and Stylistics (4) I, The Staff
Lecture—1 hour; discussion—2 hours; written reports. Prerequisite: course 103 or consent of instructor. Exercises in grammar and stylistics; translation of selected English texts into German.

105. Linguistic Analysis of German (4) II. Benware
Lecture—3 hours; assigned problem sets. The descriptive study of modern German with consideration of its structural differences from English. (Same course as Linguistics 105.)

106. History of the German Language (4) III. Benware
Lecture—3 hours; written reports. Survey of the development of the German language and study of its structure in historical perspective. (Same course as Linguistics 106.)

109. Survey of German Culture (4) I, Fetzer
Lecture—2 hours; discussion—1 hour; 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.

112. Thomas Mann (4) II. Fetzer
Lecture—3 hours; written reports. Knowledge of German not required. Close reading of the major novellas (*Tristan*, *Tonio Kröger*, *Death in Venice*), one novel (*The Magic Mountain* or *Doctor Faustus*) and selected essays. May not be counted toward the major in German.

113. Hermann Hesse (4) III. Nerjes
Lecture—3 hours; additional readings and written reports. Knowledge of German not required. A study of the main ideas and issues of the principal novels, with emphasis on

German

man's dualism and his search for self-knowledge and self-fulfillment. Discussion of such works as *Siddhartha*, *Steppenwolf*, *Narcissus and Goldmund*. May not be counted toward the major in German.

114. Goethe's *Faust* (4) II. Nerjes

Lecture—3 hours; conferences and reports. Knowledge of German not required. A detailed analysis of aesthetic critique in English. May not be counted toward the major in German.

115. German Literature of the Twentieth Century (4) I, Hoermann

Lecture—3 hours; written reports. Knowledge of German not required. Readings in major German writers from the poets at the turn of the century (Hofmannsthal, Rilke, etc.) to the playwrights (Dürrenmatt, Weiss, etc.) and prose stylists (Grass, Frisch, etc.) of today. May not be counted toward the major in German.

116. Literary Aspects of Scopenhauer and Nietzsche (4) III. Menges

Lecture—3 hours; written reports. Knowledge of German not required. Extension and transformation of the Romantic theories of art and the artist and the influence of Schopenhauer and Nietzsche on twentieth century literary phenomena, such as expressionism, and on writers such as Wedekind, Rilke, and Thomas Mann. May not be counted toward the major in German.

117. Kafka (4) I, Hoermann

Lecture—3 hours; written reports. Knowledge of German not required. Problems of truth, justice, art, and being as reflected primarily in *The Judgment*, *Metamorphosis*, *Hunger Artist*, *Josephine*, *Investigations of a Dog*, and *The Burrow*. May not be counted toward the major in German.

118. Brecht (4) II. Menges

Lecture—3 hours; written reports. Knowledge of German not required. A study of Brecht's Epic Theater and his doctrine of aesthetic alienation. May not be counted toward the major in German.

119A. Survey of German Literature from the Beginnings through Classicism (4) I, Menges

Lecture—3 hours; written reports. Prerequisite: course 4 or 6A-6B or consent of instructor. An integrated view of the philosophical, historical, and stylistic components in the development of German literary tradition up to Romanticism. Discussion in German and English.

119B. Survey of German Literature from Romanticism to the Present (4) II. Menges

Lecture—3 hours; written reports. Prerequisite: course 119A or consent of instructor. Continuation of course 119A. Discussion in German and English.

119C. Literary Interpretation (4) III. Menges

Lecture—2 hours; discussion—1 hour; written reports. Prerequisite: course 4 or 6A-6B; courses 119A and 119B recommended. Guided discussion of major German literary works and demonstrations of the technique of analysis. Discussion in German and English.

120. The Medieval Period in German Literature (4) I, Moelleken

Lecture—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.

121. Older German Literature in English Translation (4) I, Moelleken

Lecture—2 hours; discussion—1 hour; oral reports. Knowledge of German not required. Course intended for non-German majors. Analyses in English of works of German literature from the early to the High Middle Ages.

122. Older German Literature in English Translation (4) II, Moelleken

Lecture—2 hours; discussion—1 hour; oral reports. Knowledge of German not required. Course intended for non-German majors. Analyses in English of works of German literature from the late Middle Ages to the Renaissance.

123. Goethe (4) III. Nerjes

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Goethe's lyrics, *Werther*, *Götz* and the masterworks of his classical period such as *Iphigenie*, *Tasso* and *Faust*. Discussion in German and English.

*124. Schiller (4) I, Nerjes

Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Poetry and dramas of the rebellious young Schiller as exemplified by *Die Räuber* and *Kabale und Liebe*, and a critical assessment of his classical plays: *Wallenstein*, *Maria Stuart*, *Die Jungfrau von Orleans*. Discussion in German and English.

132. The German "Novelle" (4) II. 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. Fetzner

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.

140. Modern German Literature (4) III. Menges

Lecture—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.

144A. German Literature and History to 1815 (4) I, Menges

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4 or 6A and 6B or consent of instructor. Literature of Germany viewed in relation to such major social and political events as: the Reformation, the Thirty Years' War, the rise of Prussia, the impact of the French Revolution and the Napoleonic wars. Discussion in German and English.

144B. German Literature and History since 1815 (4) II, Menges

Lecture—3 hours; discussion—1 hour. Prerequisite: course 4 or 6A and 6B or consent of instructor. German literature viewed in relation to such major historical events as: the Revolution of 1848, the founding of the German Empire, World Wars I and II, and the establishment of the two Germanies after 1945. Discussion in German and English.

194H. Special Study for Honors Students (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) III, Moelleken

Seminar—3 hours. Outline of grammar; selections from Middle High German epic and lyric poetry.

203. Old Saxon (4) III, Moelleken

Seminar—3 hours. Knowledge of Modern German not required. Study of the linguistics structure and the literary significance of the language of the Old Saxon *Heland*. Offered in even-numbered years. (Same course as Linguistics 203.)

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.)

209. Historical Germanic Linguistics (4) II, Benware

Seminar—3 hours. The principles and techniques of historical linguistics will be used to study the development of the Germanic languages from Proto-Indo-European through Proto-Germanic and into early Germanic dialects such as Old Norse, Gothic, Old Saxon, and Old English. (Same course as Linguistics 209.)

210. Techniques of Library Scholarship (4) I, Fetzner

Seminar—3 hours. The bibliographical, organizational, and methodological tools and resources for advanced, independent research.

211. The Rise of German Literary Criticism (4) I, Bernd

Seminar—3 hours. The history of criticism in Germany, with some attention to classical sources. Course proceeds chronologically until the modern period, then by a study of special topics broadens to a consideration of recent approaches to German literature.

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 the origins to the middle of the twentieth century. May be repeated for credit with consent of instructor.

242. The German "Novelle" (4) III, Bernd

Seminar—3 hours. The major German *Novellen*, 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, Moelleken

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, Moelleken

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 Writings 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.

285. Middle High German Literature (4) III. Moellenken

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 "Elegantiadical" 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 "Elegantiadical," and the evolution of a new literature based on reason and wit. May be repeated for credit with consent of instructor.

291. Rococo in German Literature (4) II. Nerjes

Seminar—3 hours. The essential novels of Christoph Martin Wieland and those contemporaries of his whose literary style mirrors the euphony that is characteristic of Mozart's music. May be repeated for credit with consent of instructor.

292. Sentimentality and "Sturm und Drang" in German Literature (4) III. Nerjes

Seminar—3 hours. The German liberal authors of the eighteenth century, such as Johann George Hamann and Johann Gottfried Herder, who lived in complete disagreement with the rationalistic tenets of their age. 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. Menges

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 (1-9) 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. Prerequisites: 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 graduate 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)

Walter L. Woodfill, Ph.D., Chairperson of the Department

Department Office, 176 Voorhies Hall

Faculty

Luis Arroyo, M.A., Acting Assistant Professor
 *Arnold J. Bauer, Ph.D., Associate Professor
 William M. Bowsky, Ph.D., Professor
 *Cynthia L. Brantley, Ph.D., Assistant Professor
 David Brody, Ph.D., Professor
 Daniel R. Brower, Jr., Ph.D., Professor
 Daniel Calhoun, Ph.D., Professor
 Robert O. Crumme, Ph.D., Associate Professor
 Manfred P. Fleischer, Ph.D., Associate Professor
 Edmundo Flores, M.A., Lecturer
 Paul Goodman, Ph.D., Professor
 Nancy Grant, M.A., Acting Assistant Professor
 William W. Hagen, Ph.D., Assistant Professor
 W. Turrentine Jackson, Ph.D., Professor
 David L. Jacobson, Ph.D., Professor
 Norma Landau, Ph.D., Assistant Professor
 Gordon Leff, Ph.D., Litt.D., Visiting Professor
 Kwang-Ching Liu, Ph.D., Professor
 Jung-Pang Lo, Ph.D., Professor (Emeritus)
 *Eugene Lunn, Ph.D., Associate Professor
 C. Roland Marchand, Ph.D., Associate Professor
 Ted W. Margand, Ph.D., Associate Professor
 C. Bickford O'Brien, Ph.D., Professor (Emeritus)
 Rollie E. Poppino, Ph.D., Professor
 Don C. Price, Ph.D., Associate Professor
 Ruth E. Rosen, Ph.D., Assistant Professor
 Peggy R. Sabatier, M.A., Lecturer
 Richard N. Schwab, Ph.D., Professor
 Morgan B. Sherwood, Ph.D., Professor
 James H. Shideler, Ph.D., Professor
 Wilson Smith, Ph.D., Professor
 Stylianos Spyridakis, Ph.D., Associate Professor
 *Donald C. Swain, Ph.D., Professor
 F. Roy Willis, Ph.D., Professor
 Walter L. Woodfill, Ph.D., Professor

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.

The history major itself constitutes a valuable preparation for subsequent cultural, political, and social life. Various professional schools, in areas such as law, business administration, and medicine, have looked favorably on highly qualified students with work in history. The history major is also widely regarded as sound preparation for careers in state and local government, elementary and secondary education, librarianship, journalism, and work in data-gathering and evaluation occupations.

A student electing a major in History may complete either Plan I or Plan II. The purpose of Plan II is to encourage interested students, including those preparing for graduate work in history, to enroll in a

History

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.

History

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter (for Plan I and Plan II)	20
Five courses, including at least two from each of two of the following categories	20
a. Western Civilization: History 3, 4A, 4B, 4C, 5, 51	
b. Asian Civilization: History 9A, 9B, 90	
c. United States: History 17A, 17B, 21A, 21B, 22, 27A, 27B, 72A, 72B, 78B, 85	
Depth Subject Matter—Plan I	36
At least six courses from one of the fields of concentration* listed below. Include a two-quarter sequence of courses	24
At least three courses from one of the other fields listed	12
Total Units for the Major, Plan I	56
Depth Subject Matter—Plan II	38
At least three courses from one of the fields of concentration* listed below. Include a two-quarter sequence of courses	12
At least three courses from one of the other fields listed	12
History 101	5
History 102 in field of concentration	5
At least four units in History 198 or 199, taken as a single block, in the field of concentration	4
Total Units for the Major, Plan II	58

Fields of Concentration*

- a. European: History 102A, 102B, 102C, 102D, 102E, 102F, 102I, 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, 145A, 145B, 146A, 146B, 147A, 147B, 147C, 151A, 151B, 151C, 154, 156.
- b. United States: History 102K, 102L, 102M, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 176C, 177, 180A, 180B, 180C, 183A, 183B, 185A, 185B, 187, 188A, 188B, 189A, 189B, 189C.
- c. East Asia: History 102G, 102H, 102N, 191A, 191B, 192A, 192B, 192C, 194A, 194B.
- d. Africa: History 102O, 115A, 115B, 115C, 116.
- e. Latin America: History 102J, 161A, 161B, 162, 163A, 163B, 165, 166A, 166B, 168, 169A, 169B.
- f. A student may group courses from two related fields, (a) through (e) above, to make a field of concentration when there are not enough courses in one particular area of study. Approved groupings include: Africa and Europe, Africa and Latin America, Africa and the United States. For other groupings, or to meet special needs, a student should obtain written approval from an adviser. Within broad fields, a student may wish to concentrate some of the courses on a particular area or period, such as China or Great Britain or Medieval Europe. Special approval is not required.

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: classics, cultural anthropology, cultural geography, principles of economics, English literature, literature of the United

States, philosophy, political science, psychology, sociology, or statistics.

Major Advisers. A. J. Bauer, C. L. Brantley, W. W. Hagen, D. L. Jacobson, E. Lunn, C. R. Marchand, T. W. Margadant, D. C. Price, R. N. Schwab, S. Spyridakis.

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 107 for the Teacher Education Program.

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. W. M. Bowsky, D. Brody, D. R. Brower, W. W. Hagen, K. C. Liu, J. H. Shideler, 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, 21A, 21B, 27A, 27B, 170A, 170B, 170C, 171A, 171B, 171C, 174A, 174B, 175A, 175B, 175C, 176A, 176B, 177, 180A, 180B, 183A, 183B. The upper division courses may be used only with the consent of the instructor. (See also page 60.)

COURSES IN HISTORY

Lower Division Courses

1. Religious Ideas and Institutions in Early Western Civilization (4) III. Schwab

Lecture—3 hours; discussion—1 hour. An examination of the Judaeo-Christian tradition as it met ancient Near Eastern and classical ideas and institutions from earliest times to St. Thomas.

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, III. The Staff

Lecture—3 hours; discussion—1 hour. The growth of western civilization from ancient times through the middle ages.

4B. History of Western Civilization (4) I, II. The Staff

Lecture—3 hours; discussion—1 hour. Development of western civilization from the Renaissance through 1815.

4C. History of Western Civilization (4) II, III. The Staff

Lecture—3 hours; discussion—1 hour. The development of western civilization in the nineteenth and twentieth centuries.

5. Film Perspectives on Western Civilization (4) I, Lunn

Lecture—3 hours; discussion—1 hour; films—seven 1½ hour films will be shown. A number of classic films will be used to help explore major social, political and cultural

themes from the seventeenth century to the present. Readings and lectures will treat broad historical changes dramatized in the films.

9A. History of Asian Civilizations (4) I.

Lecture—3 hours; discussion—1 hour. The history of the major civilizations of Asia (Chinese, Japanese, Hindu, and Islamic) to the end of the eighteenth century. Emphasis will be put on the general features of the society and government, the economy, religion, philosophy, and the arts.

9B. History of Asian Civilizations (4) II.

Lecture—3 hours; discussion—1 hour. Introduction to the great changes in the major Asian countries in the past two centuries. Emphasis will be placed on the impact of the West, the search for a new culture, and the background of contemporary social and political problems.

17A. History of the United States (4) I, II, III. 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.

*21A. Race and Nationality in American History (4) II.

Goodman

Lecture—3 hours; discussion—1 hour. Sources of American nationality and its relationship to ethnic, racial, and religious minorities, 1607-1865. Experiences of groups including American Indians, Orientals, Blacks, Catholics, Jews, Irish and Germans. Tensions between majorities and minorities in the American past.

*21B. Race and Nationality in American History (4) III.

Goodman

Lecture—3 hours; discussion—1 hour. Sources of American nationality and its relationship to ethnic, racial, and religious minorities, 1865 to present. Experiences of groups including American Indians, Orientals, Blacks, Catholics, Jews, Irish and Germans. Tensions between majorities and minorities of the American past.

*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) I, Grant

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) II, Grant

Lecture—3 hours; discussion—1 hour. The history of black people in the United States from Reconstruction to the present.

*51. Imperialism in British Popular Culture (4) III.

Seminar—4 hours; term paper. Investigation of the popular culture which broadly involved people in the British imperial cause and inspired them to support it. Reading and discussion of relevant, chiefly contemporary, printed materials. No final examination. Limited enrollment.

*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-Colombian 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. Movements for Women's Rights and Status in Nineteenth-Century America (4) I, Rosen

Lecture—3 hours; discussion—1 hour. Focusing on the history of women in the United States since the end of the eighteenth century; course will also consider counterpart movements in Europe. Topics include revolutions of suf-

frage, kitchen, manners, jobs, and motherhood; women and the law, marriage, divorce, and property.

72B. Women in Twentieth-Century America (4) II. Rosen Lecture—3 hours; discussion—1 hour. Prerequisite: course 72A recommended. Continuation of course 72A into twentieth century.

***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 and Japan (4) III. Liu Discussion—4 hours; term paper. Prerequisite: consent of instructor. Reading and discussion on aspects of modern China and Japan. Background of the contemporary scene is stressed. Emphasis on China.

90B. Modernization of China and Japan (4) III. Discussion—4 hours; term paper. Prerequisite: consent of instructor. Reading and discussion on aspects of modern China and Japan. Background of the contemporary scene is stressed. Emphasis on Japan.

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. Margadant 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-D. Undergraduate Proseminar in History (5) I, II, III. The Staff Seminar—3 hours; term paper. Prerequisite: consent of instructor. 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. May be repeated for credit. Limited enrollment.

111A. Ancient History (4) I, Spyridakis Lecture—3 hours. History of the ancient empires of the Near East and of the Greek city-states to the fifth century B.C.

111B. Ancient History (4) II. Spyridakis Lecture—3 hours. History of Greece, the Hellenistic kingdoms, and Rome from the fifth century B.C. to the Punic Wars.

111C. Ancient History (4) III. Spyridakis Lecture—3 hours. History of Rome and its empire from the Punic wars to Constantine.

115A. History of West Africa (4) I, Sabatier 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. Sabatier 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.

***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. Sabatier 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** (5) 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 (5) II. Bowsky Lecture-discussion and panel presentations—3 hours. European history from Charlemagne to the twelfth century.

121C. Medieval History (5) III. 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, Swinglian-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 recommended. Western European history from about 1650 to about 1789.

133. The Age of Ideas (4) I, Schwab Lecture—3 hours. The Enlightenment and its background in the seventeenth century.

134A. The Age of Revolution (4) II. 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. Crummeey 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. The Empire: 1725-1900 (4) II. Crummeey 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. Brower 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) I, II, III. 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 1815 (4) III. Margadant, Willis Lecture—3 hours; term paper.

***143A. History of Eastern Europe** (4) II. Hagen Lecture—3 hours; term paper. History, mid-eighteenth to late nineteenth century, of the subject nationalities of the Hapsburg, Ottoman and Russian Empires (Czechs, Poles, Hungarians, Balkan, and Baltic peoples). Focus on their socioeconomic developments and movements towards cultural and political independence.

***143B. History of Eastern Europe** (4) III. Hagen Lecture—3 hours; term paper. Geographic focus as in course 143A. Concentration, late nineteenth century to the present, on the socioeconomic problems of rural society, industrialization and middle-class development; and the political problems of imperialism, nation-state formation and social revolution.

***144A. History of Germany to 1815** (4) II. Hagen Lecture—3 hours; discussion—1 hour; student presentations. Selected aspects of earlier German history, particularly since the Reformation, with a stress on social and cultural movements.

144B. History of Germany since 1815 (4) II. Hagen Lecture—3 hours; term paper; optional discussion section—1 hour. Modern German history, emphasizing social and economic changes and their connections with such major political developments as the revolutions of 1848, German unification, the world wars and Nazism, and the consolidation of the two German states since 1945.

144C. Hitler and German National Socialism: 1889-1945 (4) I, III. Hagen Lecture-discussion—3 hours; term paper. The origins of the National Socialist movement in German society and history and analysis of the autobiographical, biographical, and psychohistorical literature of Adolf Hitler.

145A. The Social History of Nineteenth-Century Europe (4) II. Margadant Lecture—3 hours; written reports. Prerequisite: course 4C recommended. A survey of European social history during the period of industrialization. Topics include population growth, family structure, economic development, urbanization, class stratification, social protest, and ideologies of social change.

145B. The Political History of Nineteenth-Century Europe (4) III. Margadant Lecture—3 hours; written reports. Prerequisite: course 4C recommended. Surveys European political history 1815-1918. Topics include the Restoration era, the Revolutions of 1848, the unification of Italy and Germany, Social Democracy, Nationalist movements, Imperialism, and 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.

NOTE: For key to footnote symbols, see page 132.

History

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.

147B. European Intellectual History, 1870-1920 (4) III, Lunn
Lecture—3 hours; term paper. The cultural and intellectual watershed of the late nineteenth and early twentieth century. The emergence of modern art and literature; psychoanalysis and the new social sciences.

***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.

151A. History of England (4) I, Woodfill
Lecture—3 hours. Prerequisite: course 4A recommended. Survey of English history to the latter part of the fifteenth century.

151B. History of England (4) II, Woodfill
Lecture—3 hours. Prerequisite: courses 4A, 4B, and 151A recommended. Survey of English history from the latter part of the fifteenth century to the latter part of the eighteenth century.

151C. History of England (4) III, Landau
Lecture—3 hours. Prerequisite: courses 4B, 4C, 151A, and 151B recommended. Survey of English history from the latter part of the eighteenth century to the present.

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.

***156. Social and Economic History of Great Britain since 1760** (5) I.
Lecture—2 hours; discussion—2 hours; research paper. Recommended: course 151C. Integration of the history of industrial, commercial, and agricultural development with the nature and course of change in demography, social organization, and urbanization from preindustrial to post-industrial Britain.

***161A. Latin American History** (4) I, Bauer
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) II, 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, Flores
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, Flores
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) II, Flores
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) III, Flores
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, Goodman
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 to 1812 to the Compromise of 1850.

171B. American Civil War (4) II, Calhoun
Lecture—3 hours. Major developments in American history from 1848 to 1865: slavery and antislavery, immigration, sectional conflict, emergence of the Republican party, the Civil War.

171C. The Emergence of Modern America (4) I, 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.

174A. Recent History of the United States (4) II, 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, Brody, 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, Brody, Shideler
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) I, 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) II, 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) III, 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) I, 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) II, Marchand
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, Marchand
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, Grant
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.

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.

185A. History of Science and Technology in America (4) II, Sherwood

Lecture—3 hours; oral and written reports. Study of science and technology in America, emphasizing the development of scientific ideas and institutions to 1890.

185B. History of Science and Technology in America (4) III, Sherwood

Lecture—3 hours; oral and written reports. Study of science and technology in America, emphasizing the development of scientific ideas and institutions since 1890.

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) I, 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) II, Price

Lecture—3 hours; term paper. Political disunion and the influx of Buddhism; reunification under the great dynasties of T'ang, Sung, and Ming with analysis of society, culture and thought.

192A. Late Imperial China: Background to Revolution (4) I, 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.

192B. Late Imperial China: Background to Revolution (4) II, 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.

192C. Revolutionary China: The Age of Mao Tse-tung (4) III, Price

Lecture—3 hours; term paper. Growth and development of the Chinese revolution from its social and intellectual origins. Analysis of such themes as the rejection of traditional culture, resistance to foreign aggression, mobilization of peasant power and the utopian dream.

***194A. History of Japan, II** (4) I.

Lecture—3 hours. Survey of Japanese history to the end of the Tokugawa period.

***194B. History of Japan, II** (4) III.

Lecture—3 hours. Prerequisite: course 194A or consent of instructor. Survey of Japanese history from the late Tokugawa period to the present.

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.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor.

Graduate Courses**201A-D. 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 Practices** (4) III, Calhoun

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.

***211. Ancient History** (4) I, II, Spyridakis

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.

***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) I, II, 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) II, Calhoun

Seminar—3 hours.

***273A-273B. Research Seminar in the Comparative History of Women and the Family** (4-4) II, III, 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) II, 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) I, 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, Liu, Price

Seminar—3 hours. Prerequisite: consent of instructor. Research on topics to be chosen by the student 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)

NOTE: For key to footnote symbols, see page 132.

Home Economics; Human Development

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 Secondary School and the Junior College (3) 1.

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 Consumer Science, 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.

It may be necessary to limit enrollment in this major due to limitations placed on UCD resources.

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	59, 60
Biological and physical sciences	
Biological sciences (Biological Sciences 1)	5
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Statistics (Mathematics 13 or Economics 12)	4-5
Additional course(s), recommended: bacteriology, physiology, or physics	4
Social sciences and humanities:	
Cultural anthropology (Anthropology 2) or sociology	4
Introduction to design	4
Economics (Economics 1A)	5

Written or oral expression (English 1, 2, 5F, 5P, and/or Rhetoric 1)	8
Psychology 1	4
Additional course(s), recommended: Economics 1B	5
Depth Subject Matter	61
Consumer Economics 141, 142	8
Food Science and Technology 100A, 100B	6
Human Development 100A, 100B	8
Consumer Science 140	4
Nutrition 101, 102	8
Textiles and Clothing 7, 172 (clothing); 6, 160 or 162 (textiles)	12
Restricted Electives	15
Applied Behavioral Sciences 171; Biological Sciences 12; Consumer Science 100, 145; Consumer Technology 111; Design 180A-180B-180C; Food Science and Technology 100AL, 100BL, 112; Human Development 30A-30B, 100C or 110; Nutrition 102L, 118; Textiles and Clothing 17A, 17B, 160, 160L or 162, 162L.	
Unrestricted Electives	59-60
Total Units for the Major	180

Major Adviser. C. M. Bruhn (*Food Science and Technology*).

Graduate Study. See page 101.

Teaching Credential Subject Representative. See under the major in Agricultural Education (page 107).

Home Economics Education

See Agricultural Economics 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 (Child) Development

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 shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter (must be completed prior to admission to major)	42-46
Anthropology 1 and 2	8
Biological Sciences 1 (or the equivalent)	5
Genetics 10 or 100A-100B or 115	4-6
Nutrition 10 or 101	3-4
Physiology (Physiology 2 or 101 recommended)	4-5
Psychology 1, 15, 16	11
Statistics (Mathematics 13)	4
Human Development 30A-30B	3
Depth Subject Matter	48
Human Development, upper division courses to include 100A-100B-100C	20
Additional upper division Human Development or related courses from list of restricted electives as determined in consultation with faculty adviser	28
Breadth Subject Matter	20
English or rhetoric, to include at least one upper division course, one course emphasizing expository skills (English 1, 2, 3, 103, or Rhetoric 1) and one course emphasizing criticism or analysis of persuasive forms (English 45, 110A or Rhetoric 120)	12
American history or political science	8
Unrestricted Electives	66-70
Total Units for the Major	180

Major Adviser. J. N. Welker.

Related Major Program. See the major in Applied Behavioral Sciences (page 148).

Graduate Study. See page 101.

COURSES IN HUMAN DEVELOPMENT

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 123 AOB-IV.

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 (Thompson in charge)
(P/NP grading only.)

Upper Division Courses

100A. Infancy and Early Childhood (4) I, Harper; III, 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) I, Harper; II, Horowitz
Lecture—4 hours; field observations of school-age children. Prerequisite: course 100A. 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, Horowitz; III, Hawkes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B. Biological, cognitive and social psychological aspects of adult development.

101. Cognitive Development (4) III. Horowitz
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B. Theories of cognitive development including developmental views of perception, learning, memory, concept formation, and language.

102. Social and Personality Development (4) II, Bryant
Lecture—4 hours. Prerequisite: course 100B. 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—3 hours; discussion—1 hour. Prerequisite: course 100A. Cross-cultural studies of children in developing countries and among minority groups in the U.S.

110. Contemporary American Family (4) II, Hawkes; III, Crockenberg
Lecture—2 hours; discussion—2 hours. Prerequisite: course 100A. Current and future factors influencing American families including changing sex roles, changing sexual mores, and parenthood.

120. Research Methods in Human Development (4) I, Barton; II, Harper
Lecture—2 hours; discussion—2 hours. Prerequisite: course 100C. Research in selected areas of human development (i.e., infancy, learning, cognition, socialization, personality).

121. Psychological Assessment of Children (4) I, II, III. Bryant, Werner
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100B; elementary statistics. Current issues and methodology related to the process of psychological assessment with children.

130. Emotionally Disturbed Children (4) I, Bryant; II, Bachtold
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B. Discussion of psychosis, neurosis, behavior disorders, and learning difficulties in children.

131. Developmental Disabilities (4) I, III. Barton, Werner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B. Mental retardation and special learning disabilities, etiology, diagnosis, education and socialization. Introduction to community resources.

132. The Gifted (3) II, Bachtold; III, Horowitz
Lecture—3 hours. Prerequisite: course 100B. Conceptualization, identification and education of the intellectually and creatively gifted individual.

140A-D. Laboratory in Early Childhood Education (4) I, II, III. The Staff (Welker in charge)

Discussion—1 hour; seminar—2 hours; laboratory—5 hours. Prerequisite: course 30A. Interaction with children 6 months to 5 years; observation of preschool program, evaluation and testing of theories of early childhood education and child development: **A.** Communication; **B.** Infancy; **C.** Curriculum Analysis; **D.** Instructional Procedures.

141. Laboratory: Children and Their Environments (4-6)

I, II, III. Bachtold, Bryant
Discussion—2 hours; field placement—6-12 hours. Prerequisite: course 100B and consent of instructor. Study and facilitation of children's affective, cognitive, physiological and social development within context of family and school environments, counseling/clinical situations, hospitals and foster group homes. May be repeated for credit for a total of 12 units.

142A. Field Experience with Exceptional Children (3-5)

I, III. The Staff (Werner in charge)
Seminar—1 hour; field placement—6-12 hours. Prerequisite: course 130 (concurrently) and/or consent of instructor. Supervised field experience with emotionally disturbed children. May be repeated for credit for a total of 12 units.

142B. Field Experience with Exceptional Children (3-5)

I, III. The Staff (Werner in charge)
Seminar—1 hour; field placement—6-12 hours. Prerequisite: course 131 (concurrently) and/or consent of instructor. Supervised field experience with children who have developmental disabilities. May be repeated for credit for a total of 12 units.

142C. Field Experience with Exceptional Children (3-5)

II, III. The Staff (Werner in charge)
Seminar—1 hour; field placement—6-12 hours. Prerequisite: course 132 (may be taken concurrently with consent of instructor.) Supervised field experience with gifted children. May be repeated for credit for a total of 12 units.

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.)

Graduate Courses

211. Physiological Correlates of Behavioral Development (3) I, 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) II. Barton, 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. Horowitz
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) III. Lynn

Seminar—3 hours. Prerequisite: course 290. 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.

290. Seminar (3) I, II, III. The Staff (Bryant in charge)

Seminar—3 hours. Discussion and evaluation of theories, research, and issues in human development. Different topics each quarter. (S/U grading only.)

298. Group Study (1-5) 1, II, III. The Staff (Thompson in charge)

299. Research (1-12) I, II, III. The Staff (Thompson in charge)
(S/U grading only.)

Humanities

(College of Letters and Science)

Program Office, 4208 Storer Hall

Committee in Charge

Richard N. Schwab, Ph.D. (*History*), Committee Chairperson
L. Price Amerson, Ph.D. (*Art*)
Diane L. Murray, Ph.D. (*English*)
Wesley E. Thompson, Ph.D. (*Classics*)
William E. Valente, M.A. (*Music*)
Michael V. Wedin, Ph.D. (*Philosophy*)

The Major Program

The Humanities major allows a student latitude in combining the courses offered by existing departments into a major suiting his or her individual needs, providing the courses selected make a coherent and integrated plan of study. Humanities majors must fulfill all College breadth requirements, and their upper division programs must be approved both by advisers from the departments primarily involved (those departments in which the student is taking twelve or more units) and by the supervising committee.

Lower division courses should be taken in the departments in which a student plans to do his or her principal upper division work.

Humanities

A.B. Major Requirements:

Preparatory Subject Matter UNITS
20-30

All courses in two of the following eight categories: 20-30

(a) Three courses from Art 1A, 1B, 1C, 1D

(b) Classics 10, 40, 41

NOTE: For key to footnote symbols, see page 132.

Integrated Studies; International Agricultural Development

- (c) Dramatic Art 15, 20
 (d) English 30A-30B-30C or 46A-46B-46C
 (e) A foreign language: intermediate courses
 (f) History 4A, 4B, 4C
 (g) Music 27A-27B or 4A-4B-4C or 21A-21B-21C
 (h) Philosophy 21, 22, 23

Depth Subject Matter 45

Twelve upper division units in each of two departments, both of which will normally be in the humanities, and one of which will always be in the humanities 24
 Additional upper division units 21

Recommended: one quarter of Independent Study (15 of the 45 upper division units required) in the senior year, pulling together the separate strands of study in a project demonstrating the validity of the student's approach.

Total Units for the Major 65-75

Major Adviser. W. E. Thompson (*Classics*), and committee.

Integrated Studies

(College of Letters and Science)

Kenneth R. Greider, Ph.D., Program Director
 Program Office, 4208 Storer Hall

Committee in Charge

Marjorie Grene, Ph.D. (*Philosophy*), Committee Chairperson
 Kenneth R. Greider, Ph.D. (*Physics*)
 Fritz Sammer-Frankenegg, Ph.D. (*German*)
 Alan A. Stambusky, Ph.D. (*Dramatic Art*)

Faculty

Susan Erickson-Bloch, Ph.D., Lecturer (*Integrated Studies*)
 Kenneth R. Greider, Ph.D., Professor (*Physics*)
 William W. Hagen, Ph.D., Assistant Professor (*History*)
 Nancy Lieber, Ph.D., Lecturer (*Integrated Studies*)
 Arthur E. McGuinness, Ph.D., Associate Professor (*English*)
 Robert M. Murphey, Ph.D., Associate Professor (*Psychology*)
 David A. Robertson, Ph.D., Assistant Professor (*English*)
 Alan A. Stambusky, Ph.D., Professor (*Dramatic Art*)
 Lenora Timm, Ph.D., Assistant Professor (*Linguistics*)

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 (Greider 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 1976-77: "tradition, revolution, and modern society." Fields for 1976-77: physics, psychology, social anthropology, political science.

2A, 2B, 2C, 2D, 2E. Ideas and Issues in the Arts (4) I, II, III. The Staff (Greider 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 1976-77: "tradition, revolution, and modern society." Fields for 1976-77: history, music, literature, drama, theology.

***6. 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.)

***7. Seminar** (1) I, II, III. The Staff (Greider in charge)
 Conference—1 hour. Preparation of a research report. Normally to be taken with course 6. May be repeated for credit. (P/NP grading only.)

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 (Greider 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)

Faculty

Norman B. Akesson, M.S., Professor (*Agricultural Engineering*)

William J. Chancellor, Ph.D., Professor (*Agricultural Engineering*)
 William G. Davis, Ph.D., Associate Professor (*Anthropology*)
 David E. Hansen, Ph.D., Associate Professor (*Agricultural Economics*)
 Desmond A. Jolly, Ph.D., Lecturer (*Agricultural Economics*)
 Pran N. Vohra, Ph.D., Professor (*Avian Sciences*)

The Major Program

The Internal Agricultural Development major provides opportunity for students to develop competence in a technical field and, in addition, to acquire those special qualities of mind and spirit requisite for effective performance in underdeveloped areas of the world. These individuals must be perceptive, sensitive, and understanding, and possess knowledge of the social-political-economic-cultural relationships existing among people. Graduates concerned with resources development, whether American or foreign, will find opportunities in government service and commercial firms with overseas departments, providing a wide variety of career opportunities.

Students in this major may select their areas of technical specialization from any of the fields of interest broadly grouped in agriculture and the environmental sciences. A wide selection of courses emphasizing development in the humanities, social sciences, and economics is available to students in order to develop some understanding of the broad cultural and economic environments in which agriculture operates in particular areas outside the United States.

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. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	54-55
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Physics	4
Mathematics (mathematics and/or statistics)	6-7
Economics	5
Biological sciences (animal or plant physiology, bacteriology, biochemistry, botany, genetics, zoology)	15
English and/or rhetoric	8
Depth Subject Matter	34
International Agricultural Development 101 or 102 and 190, and (International Agricultural Development 10, 195, 198, 199)	10
Primary field of specialization	24

Courses chosen to provide depth of understanding in one of the following, or closely related, fields and to include at least 16 upper-division units: agricultural economics, animal sciences, environmental sciences, food sciences, plant sciences, resource sciences; additional units earned in international agricultural development courses may be used in partial satisfaction of this specialization requirement.

Breadth Subject Matter	18
Social sciences and humanities†	18
Restricted Electives	44
Agricultural and other science electives (including added mathematics)	16
Economics or agricultural economics	8
Humanities and social science courses relevant to an understanding of development (Anthropology 2, 122, 123, 162; Economics 118; Environmental Studies 101, 145; Geography 2, 5, 141, 142; History 188A, 188B; Political Science 4, 108, 109A, 109B, 145, 170, 178, 185; Sociology 1, 102, 141, 144) or other courses of comparable emphasis**	20
Unrestricted Electives†	29-30
Total Units for the Major	180

Major Adviser. W. J. Flocker (*Vegetable Crops*).

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. J. F. Harrington (*Vegetable Crops*).

Related Courses. See Agrarian Studies 2; Agricultural Economics 125, 148, 222; Agronomy 111, 210; Animal Science 117; Anthropology 221; Economics 115A-115B, 118, 215A-215B; Food Science and Technology 112; Geography 142; 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 Office of the College of Agricultural and Environmental Sciences, 228 Mrak Hall.

Lower Division Course

10. Population, Food, and Life; Quality or Subsistence? (3) II. Jolly
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.

Upper Division Courses

101. Crop Production under Tropical Conditions (4) II.
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.

102. Livestock and Poultry Production in Developing Areas (4) I. The Staff (Vohra in charge)
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.

190. Proseminar in International Agricultural Development (3) III.
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.

195. Field Study in Mexican Agricultural Development (3) II. Hansen
Field trip—8 days; seminar—four 2-hour sessions. 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. Preenrollment required. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Akeson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Graduate Group Chairperson 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. Chancellor
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.

299. Research (1-9) I, II, III. The Staff (Graduate Group Chairperson in charge) (S/U grading only.)

International Relations

(College of Letters and Science)

Joyce K. Kallgren, Ph.D., Program Director
Program Office, 351 Voorhies Hall

Committee in Charge

- Joyce K. Kallgren, Ph.D. (*Political Science*),
Committee Chairperson
- W. Eric Gustafson, Ph.D. (*Economics*)
- William W. Hagen, Ph.D. (*History*)
- Robert J. Lieber, Ph.D. (*Political Science*)
- Ruth B. York, Ph.D. (*French*)

The Major Program

This major is designed to meet the needs of students interested in an understanding of contemporary world politics and economics. The program is built around courses concerned with international relations in political, geographic, economic, and social terms, and in the light of historical precedents.

International Relations

A.B. Major Requirements:

Preparatory Subject Matter	UNITS	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, 5, 9A, 9B, 17B	8	
Approximately 26 units (or the equivalent) in one modern foreign language	0-26	
Recommended: one course in statistics, (e.g., Mathematics 13, Economics 12, Sociology 46A, 46B)		
Depth Subject Matter	52	
Political Science 127	4	
Economics 115A, 160	8	
One course from History 137C, 146B, 161B, 168, 192C	4	
One course from Political Science 122, 123, 124, 125	4	
Interdisciplinary seminar, Political Science 192A, 192B (normally taken in senior year)	8	
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	78-104	

Course List for Cluster Emphases

- (1) *Economics Emphasis* (two courses in Economics required)
 - Anthropology 122
 - Economics 115B, 116, 117, 118, 123, 161
 - Geography 141, 142, 143, 154
 - History 115A, 115B, 115C, 137C, 143B, 145A, 146A, 146B, 156, 161B, 165, 168, 174C, 192C, 194B
 - Political Science 117, 122, 123, 124, 125, 128, 132, 137, 139, 141, 142, 145, 177, 178, 185
 - Sociology 118, 141, 170
- (2) *Political Emphasis* (two courses in Political Science required)
 - Anthropology 123, 128
 - Economics 115B, 116, 117, 118, 123, 161
 - Geography 141, 142, 143, 154
 - History 115A, 115B, 115C, 137C, 143B, 144B, 144C, 146A, 146B, 151C, 161B, 162, 163B, 166B, 168, 174A, 174B, 180C
 - Political Science 117, 121, 122, 123, 124, 125, 126, 128, 132, 134, 137, 139, 141, 142, 145, 147, 149, 177, 178, 185
 - Sociology 118, 141, 170
- (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 105B, 128, 139A, 139B, 146, 147A, 147B, 162, 190, 191, 192
 - Economics 110B, 115A, 115B, 116, 117, 118, 123, 161
 - Geography 119, 121, 122A, 122B, 123A, 123B, 124, 125A, 125B
 - History 115A, 115B, 115C, 116, 137B, 137C, 141, 143B, 144B, 146A, 146B, 147C, 151C, 151C, 162, 163B, 165, 166B, 168, 174A, 192C, 194B
 - Political Science 131, 132, 134, 138, 139, 141, 143, 144, 145, 146, 147, 148A, 148B, 149
 - Sociology 147

Major Adviser. _____

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

**Students with special interest in particular countries or regions may obtain approval of the adviser to elect social science courses appropriate to such interests in satisfying this requirement.

‡Students not proficient in a foreign language should choose courses in a single language through course 3 as electives.

NOTE: For key to footnote symbols, see page 132.

Italian

Teaching Credential Subject Representative. J. K. Kallgren. See page 107 for the Teacher Education Program.

Italian

(College of Letters and Science)

Department Office, 515 Sproul Hall

Faculty

*Alfonso De Petris, *Dottore in Lettere*, Associate Professor
Dennis J. Dutschke, Ph.D., Assistant Professor
Gustavo Foscarini, M.A., Lecturer

The Major Program

This major consists of courses in language, civilization and literature. The use of Italian is stressed on all levels and a knowledge of the language is required for literature courses which are taught only in Italian. The department also offers literature courses in translation (not open to majors) and a yearly course on Italian civilization, also taught in English. A degree in Italian provides a well-rounded liberal arts background for both graduate studies in the humanities and for a wide range of careers in such areas as civil service, library science, business, travel, and education. Practical experience in education is provided through a teaching internship program offered in conjunction with the Davis Unified School District.

Italian

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-18
Italian 1, 2, 10A, 10B (or the equivalent)	0-18
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	36-54

Recommended

One year of college Latin or a Romance Language.

Major Adviser. G. Foscarini.

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 97.

Teaching Credential Subject Representative. A. De Petris. See page 107 for the Teacher Education Program.

COURSES IN ITALIAN

Lower Division Courses

A course may not ordinarily be taken for credit if it is a prerequisite to a course already completed. Students offering high school language preparation as a prerequisite must take a placement test.

1. Elementary Italian (6) I, II, III. The Staff
Lecture—5 hours; laboratory—1 hour. Basic Italian vocabulary and structure, aimed at enabling the student to understand and use standard Italian. Not open for credit to students who have completed the first two years of high school Italian.

2. Elementary Italian (6) I, II, III. The Staff
Lecture—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1

6. Intermediate Grammar and Composition (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 1 and 2 or the equivalent. Exercises in grammar and stylistics; study of the idiomatic phenomena of the language; written papers based on stylistic examples from literature.

8A. Italian Conversation (3) I, II, III. Foscarini
Discussion—3 hours. Prerequisite: course 2. A course designed to offer practice in speaking Italian. (P/NP grading only.)

8B. Italian Conversation (3) II, III. Foscarini
Discussion—3 hours. Prerequisite: course 8A. A course designed to offer practice in speaking Italian. (P/NP grading only.)

10A. Intermediate Italian (3) II. The Staff
Lecture—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) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 10A. Continuation of course 10A. Considered the minimum prerequisite for participation in Education Abroad Program.

98. Directed Group Study (1-5) I, II, III. The Staff
Primarily intended for lower-division students. (P/NP grading only.)

Upper Division Courses

101. Advanced Conversation, Composition, and Grammar (4) II. The Staff
Lecture—3 hours; weekly essays. Prerequisite: course 10B or consent of instructor.

102. Advanced Conversation, Composition, and Grammar (4) III. De Petris
Lecture—3 hours; weekly essays. Prerequisite: course 101 or consent of instructor. Offered in odd-numbered years.

107. Survey of Italian Culture and Institutions (4) I, Foscarini
Lecture—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—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 Nuovo*, and Petrarch.

***113B. Italian Literature before the Renaissance: Dante's "Divina Commedia and Boccaccio."** (4) III.
Lecture—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) I, The Staff
Lecture—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—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 library standard.

118. Italian Literature of the Eighteenth Century (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 10B or consent of instructor. The development of modern Italian literature. Emphasis on the work of Goldoni, Bettinelli, Barretti, Farini, Alfieri and Vico.

***119. Italian Literature of the Nineteenth Century** (4) II. The Staff
Lecture—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) III. The Staff
Lecture—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—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. The Staff
Lecture—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* (offered in even-numbered years); the *Divina Commedia* (offered in odd-numbered years).

***139B. Italian Literature in English: Boccaccio, Petrarch and the Renaissance** (4) II. The Staff
Lecture—3 hours; term paper. Petrarch and Boccaccio and their relations to the Middle Ages add the Renaissance (offered in even-numbered years); the renaissance, with particular attention to the works of Lorenzo de' Medici, Leonardo da Vinci, Machiavelli, Ariosto, Michelangelo, and Tasso (offered in odd-numbered years).

***139C. Italian Literature in English: Modern Italian Literature** (4) III. The Staff
Lecture—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).

194H. Special Study for Honors Students (5) I, II, III. The Staff (Bach in charge)
Prerequisite: open only to honors students. Guided research leading to an honors paper.

197TC. Community Tutoring in Italian (1-5) I, II, III. Foscarini
Discussion—1-2 hours; laboratory—2-4 hours. Prerequisite: consent of instructor. Field experience as Italian tutors or teacher's aides. May be repeated for credit up to 10 units. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-4) I, II, III. The Staff (Bach in charge)
Prerequisite: consent of instructor. Directed individual study for advanced undergraduate students. (P/NP grading only.)

Japanese

See Oriental Languages

Land, Air and Water Resources

(College of Agricultural and Environmental Sciences)

Donald R. Nielsen, Ph.D., Chairperson of the Department
Department Office, 113 Veihmeyer Hall (752-0453)

Faculty

Atmospheric Science Section

Leonard O. Myrup, Ph.D., Vice Chairperson of the Section Office, 127 Hoagland Hall (752-6331/1406)

John J. Carroll III, Ph.D., Associate Professor
Kinsell L. Coulson, Ph.D., Professor
Jerry L. Hatfield, Ph.D., Assistant Professor
Leonard O. Myrup, Ph.D., Associate Professor
Kit K. Wagner, Ph.D., Assistant Professor

Soils and Plant Nutrition Section

Lynn D. Whittig, Ph.D., Vice Chairperson of the Section Office, 139 Hoagland Hall (752-1406)

*Daniel G. Aldrich, Ph.D., Professor
Eugene L. Begg, B.S., Lecturer
Francis E. Broadbent, Ph.D., Professor
A. Lloyd Brown, Ph.D., Lecturer
Richard G. Burau, Ph.D., Associate Professor
C. C. Delwiche, Ph.D., Professor
Emanuel Epstein, Ph.D., Professor
Frank F. Harradine, Ph.D., Professor Emeritus
Gordon L. Huntington, M.S., Lecturer
Donald N. Munns, Ph.D., Associate Professor
H. Michael Reisenauer, Ph.D., Professor
Victor V. Rendig, Ph.D., Professor
Dennis E. Rolston, Ph.D., Assistant Professor
Michael J. Singer, Ph.D., Assistant Professor
Harry O. Walker, Ed.D., Lecturer
Lynn D. Whittig, Ph.D., Professor

Water Science and Engineering Section

Robert H. Burgy, M.S., Vice Chairperson of the Section Office, 113 Veihmeyer Hall (752-0453)

Jaime Amoroch, Ph.D., Professor
James W. Biggar, Ph.D., Professor
Robert H. Burgy, M.S., Professor
Lloyd D. Doneen, Ph.D., Professor Emeritus
Donald W. Grimes, Ph.D., Lecturer
Robert M. Hagan, Ph.D., Professor
Delbert W. Henderson, Ph.D., Professor
Theodore C. Hsiao, Ph.D., Professor
Allen W. Knight, Ph.D., Professor
James N. Luthin, Ph.D., Professor
Elmer R. Malakoff, LL.B., Lecturer
Miguel A. Marino, Ph.D., Associate Professor

NOTE: For key to footnote symbols, see page 132.

Robert J. Miller, Ph.D., Lecturer
Donald R. Nielsen, Ph.D., Professor
William O. Pruitt, Jr., M.S., Lecturer
Frank E. Robinson, Ph.D., Lecturer
Verne H. Scott, Ph.D., Professor
Margaret W. Silk, Ph.D., Assistant Professor
Theodor S. Strelkoff, Ph.D., Professor
Kenneth K. Tanji, M.S., Lecturer
Frank J. Veihmeyer, Ph.D., LL.D., Professor Emeritus

Major Programs and Graduate Study. See the majors listed under Resource Sciences and Engineering on page 66. For graduate study see page 101 and the *Announcement of the Graduate Division*.

Related Courses. See under Atmospheric Sciences, Nutrition, Soil Science, Water Science.

Latin

See Classics

Law, School of

Pierre R. Loiseaux, LL. B., LL.M., Dean of the School
Richard C. Wydick, LL. B., Associate Dean of the School
Ron L. Gordon, J.D., Assistant Dean of the School
Dean's Office, 1011 Martin Luther King, Jr. Hall

Faculty

*Homer G. Angelo, J.D., LL.M., Professor
John D. Ayer, J.D., LL.M., Professor
Edward L. Barrett, Jr., J.D., Professor
Brigitte M. Bodenheimer, J.U.D., LL.B., Professor
Edgar Bodenheimer, J.U.D., LL.B., Professor Emeritus
Carol S. Bruch, J.D., Acting Professor
Ann L. Diamond, LL.B., Lecturer
Howard L. Dickstein, J.D., LL.B., Lecturer
Joel C. Dobris, LL.B., Acting Professor
Harrison C. Dunning, LL.B., Professor
Boyd K. Dyer, LL.B., Visiting 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
Susan F. French, J.D., Acting Professor
Alvin L. Goldman, LL.B., Visiting Professor
*Gary S. Goodpaster, J.D., Professor
James E. Hogan, LL.B., Professor
*John E. Huerta, J.D., Acting Professor
Emma Coleman Jones, J.D., Acting Professor
Friedrich K. Juenger, J.D., Professor
Pierre R. Loiseaux, LL.B., LL.M., Professor
Jean C. Love, J.D., Professor
David Miller, LL.B., Acting Professor
John B. Oakley, J.D., Acting Professor
*Raymond I. Parnas, J.D., LL.M., S.J.D., Professor
*John W. Poulos, J.D., Professor

Land, Air and Water Resources; Law

Edward H. Rabin, LL.B., Professor
Daniel L. Simmons, J.D., Acting Professor
Mortimer D. Schwartz, J.D., LL.M., M.S., Professor (Law Librarian)
James F. Smith, J.D., Lecturer
Ronald W. Tochtermann, LL.B., Lecturer
Jerald L. Wilkerson, 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 118. The symbols are (I) for Fall Semester and (II) for Spring Semester.

COURSES IN LAW

Professional Curriculum

First Year

200. Introduction to the American Legal Process (1) I.
E. Bodenheimer, Love
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 legislatures, and the acquisition of the skills of a lawyer (S/U grading only)

201A-201B. Property (3-3) I-II. Dobris, Dunning, French, 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-II. Fessler, Loiseaux
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, pending completion of sequence)

203A-203B. Civil Procedure (2-4) I-II. Miller, Oakley
Discussion—2-4 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. Jones, Love, Wilkerson, Dickstein
Discussion—3-3 hours. The 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, Feeney, Hogan
Discussion—3 hours. A study of the elements and policies of selected criminal offenses

207A-207B. Legal Research and Writing (2-1) I-II. Lewis
Discussion—1-2 hours. Small group instruction in the techniques of legal research and writing (S/U grading only, pending completion of sequence)

Law

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
- (b) Business Law: Law 213, 214, 215, 228, 229, 236, 241, 262, 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, 281
- (i) Health Law: Law 266, 280
- (j) International, Comparative and Foreign Law: Law 238, 248, 249, 255, 257
- (k) Labor Law: Law 251, 252, 260, 278, 279
- (l) Procedure and Jurisdiction: Law 205, 219, 242, 246
- (m) Property and Environmental Law: Law 232, 256, 264, 285
- (n) Public Law: Law 231, 235, 261, 265
- (o) Skills and Litigation: Law 210, 263, 410, 415
- (p) Taxation: Law 220, 245, 247, 268, 271
- (q) Topical Survey Courses: Law 244, 282, 286, 298, 299
- (r) Clinical Programs: Law 420A-420B, 430A-430B, 450A-450B, 460, 470A-470B, 480A-480B, 495A-495B

205. Remedies (2) I, Love; II, Wilkerson

Discussion—2 hours. This course examines legal and equitable remedies, including damages, injunctive relief, and restitutionary remedies. Offered 1976-77 only.

209. The Judicial Process (2) II, E. Bodenheimer

Discussion—2 hours. The main purposes of this course are (1) to offer a detailed study of the role which logic, public policy, and consideration of justice play in the process of adjudication, with special emphasis upon the function of the judiciary in the political and constitutional structure; and (2) to analyze the various techniques of legal reasoning which are accepted as legitimate tools of persuasion in the courtroom.

210. Skills (2) II, Ayer

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.)

213. Business Organizations I (2) I, Fessler

Discussion—2 hours. This business enterprise owned by relatively few persons is the focus of 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, Dykstra

Discussion—3 hours. Building upon the concepts developed in Business Organizations I, the focus of this practitioner-oriented offering is upon the legal problems surrounding the dominant phenomenon of the industrial state—the public issue corporation. Comparative attention is given to the traditional statutory and judge-made legal

principles as well as to the rapidly expanding "federal corporation law." Within this context emphasis is placed upon a comparison of the provisions of the California Corporations Code with the statutory law of sister states which offer the enterprise the alternative of "foreign incorporation." 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, Dyer

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 socio-economics demands of the modern state.

216. Commercial Law (3) I, Ayer

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 is helpful before, though not a prerequisite to, enrollment in Debtor and Creditor.

217. Constitutional Law I. (3) I, Barrett

Discussion—3 hours. Division of powers between the national government and the states. Constitutional limitations on governmental power derived from the due process and equal protection clauses.

218. Constitutional Law II (2) II, Barrett

Discussion—2 hours. The state action concept; freedom of speech and religion; separation of powers, including the case and controversy doctrines and the powers of the President.

219. Evidence (4) I, Miller; 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, Simmons; II, Dyer

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, French

Discussion—3 hours. Study of basic estate planning devices, with emphasis on wills and trusts.

222. Trusts, Wills and Decedents' Estates II (3) II, Dobris, French

Discussion—2 hours. Prerequisite: course 221. Substantive law necessary to prepare and administer modern estate plans.

*223. Estate Planning (2) II, The Staff

Discussion—2 hours. Prerequisite: courses 221, 222 and 245. Detailed consideration of modern estate planning and administration.

225. Marital Property (2) I, Bruch; II, B. Bodenheimer

Discussion—2 hours. California community property law, property consequences of marriage dissolution, and marital property settlement agreements.

226. Criminal Procedure (Short Course) (3) I, Smith

Discussion—3 hours. The police function: arrest, search, surveillance, confessions, lineups, the exclusionary rule.

227. Criminal Procedure (Long Course) (4) II, Tochterman

Discussion—4 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 (2-3) II, Jacobs

Discussion—2-3 hours. Prerequisite: course 220, and either courses 213 and 214 or 215; course 247 (concurrently). Consideration of selected problems in business planning.

*229. Problems of Small Business (1-2) II, Jacobs

Seminar—1-2 hours. Prerequisite: course 220, and either courses 213 and 214 or 215; course 247 (concurrently). Consideration of selected problems of counseling small businesses.

230. Family Law (3) I, Bruch; II, B. Bodenheimer

Discussion—3 hours. Course covers among other things, marriage and de facto families, legal aspect of birth control, family support obligations (including support of older generation), juvenile dependency and neglect, illegitimacy and legitimation, guardianship, private and agency adoptions, marriage dissolution and annulments, efforts to prevent dissolution, and child custody. Considerable emphasis will be on family law reform, present trends in the United States and elsewhere, and on recent California developments.

231. Legislative Process (1) I, Oakley

Discussion—1 hour. An examination of the structure and function of the legislative branch of government with empirical reference to Congress and the California Legislature. Among related topics to be considered are: (1) the process of enacting legislation, including the drafting of bills, the committee system, and the development of legislative history, (2) the roles of other governmental institutions and of special interest groups in the formulation of legislative policy and specific legislation, and (3) judicial perspectives on the legislative branch, including the delegation of legislative power, the construction of statutes, and the constitutional hegemony of the courts. Each student will be required to submit a critical paper of substantial length assessing, in the context of a topic of contemporary legislative interest, the validity and utility of the concepts developed in the course. No examination.

232. Land Finance (2) I, Rabin

Discussion—2 hours. Selected problems in the acquisition, financing, and development of real estate. The course will emphasize current California law and practice. Students may elect, for an additional unit of credit, to draft notes, deeds, mortgages, contracts, and other instruments involving real property. Each instrument will be individually evaluated.

*233. Philosophy of Responsibility and Punishment (1½) I.

Seminar—1½ 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 (2) I, II, Diamond

Seminar—2 hours. Prerequisite: courses 225 and 230. This is a comprehensive treatment of family law practice using the vehicle of actual case histories. The seminar will cover all aspects of family law from the initial interview through trial, with student participation in such situations as the initial interview, settlement, negotiations, and depositions. Expert witnesses, such as accountants and appraisers, will be invited to demonstrate their role in family law practice. Limited enrollment. A term paper will be required in lieu of a final examination. (S/U grading only.)

235. Administrative Law (2) II, Simmons

Discussion—2 hours. This course deals with the constitutional and statutory principles governing action by the executive branch of government (federal and state), and judicial review of those actions, including: the requirements

and nature of hearings before administrative agencies acting in adjudicatory and legislative capacities; the standing of parties to intervene in administrative hearings and to seek review by the courts of administrative actions; the availability of judicial review (herein of "sovereign immunity," "exhaustion of administrative remedies," and "ripeness" of administrative action for judicial review); the scope of judicial review of findings of fact and conclusions of law reached by administrative agencies (herein of "administrative discretion").

236. Securities Regulation (3) II. Dykstra
Discussion—3 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, intra-state 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, Jones
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 part of the course includes bank deposits and collections, and the relationship between banks and customers. The relationship of parties in credit-card transactions will also be considered.

***238. Foreign Legal Systems** (2) II.
Discussion—2 hours. Examination of international and foreign legal systems and the responsibilities of and opportunities for lawyers in international affairs. Basic and emerging concepts and terminology in international law and in the relations between national legal systems will be studied. The shortcomings of classic international law will be examined in the light of the rapidly changing needs of the world. Participants will be given an opportunity to learn fundamental techniques of research in international law and to look at one or more key contemporary problems such as skyjacking and other acts of terrorism; international environmental protection; the needs of developing nations in Latin America, Asia, and Africa; human rights; and efforts to regulate the use of armed force. Visiting lecturers will discuss special current topics. In subsequent years, the course may be devoted to detailed study of the legal systems of one or more nations such as the legal systems of Africa or Latin America.

***241. Legal Accounting** (2) II.
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 (4) I, Bruch; II, Juenger
Discussion—4 hours. Study of transactions with multistate contracts. The topics covered include jurisdiction, effect of foreign judgments, and choice of applicable law. Special attention will be given to the judicial techniques used in solving conflicts problems.

243. Debtor and Creditor (3) II. Ayer
Discussion—2 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 (1) II, Schwartz
Discussion—1 hour. 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 (2) I, Simmons
Discussion—2 hours. This course deals with Federal and California death and gift taxes. While a general familiarity

with community property and the division of interests in property is helpful, there are no prerequisites to this class.

246. Federal Jurisdiction (3) I, Oakley
Discussion—3 hours. Prerequisite: courses 217 and 218. A survey of the federal court system and an examination of the sources and substance of federal jurisdiction. Attention will be devoted principally to: (1) the parameters of appellate and collateral review of state court decisions in the federal courts and of the federal question, diversity, and maritime jurisdiction of the federal trial courts (2) justiciability, abstention, mootness, sovereign immunity and other constraints on the exercise of federal jurisdiction, (3) the choice of the law to be applied by federal courts (4) the dynamics of precedent and authority among the federal courts and between federal and state courts and (5) political factors in the appointment of the federal judiciary and the exercise of federal jurisdiction.

247. Federal Taxation II (3) II, Jacobs
Discussion—3 hours. Prerequisite: course 220. Emphasis on income tax problems of corporations and their shareholders.

248. International Business Transactions (3) II, Angelo
Discussion—3 hours. Basic introduction to legal problems and techniques in international trade and investment. Foreign and U.S. law materials will be examined. Students will be presented with documents from actual recent transactions which have arisen in the representation of U.S. interests in Europe, Africa, and Latin America involving sales of goods (including agricultural products), establishing foreign corporations and branches, taxation in more than one country, antitrust, and regulation by international organizations such as the GATT. Offered in odd-numbered years. Not open to students who enrolled in Law 270, Winter 1976.

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, E. Bodenheimer
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) I, Goldman
Discussion—4 hours. The principal concern of this course is the right to organize and to engage in collective bargaining. Emphasis will also be given to other legal developments which effect the work environment.

***252. Labor Standards** (2) I, Goldman
Discussion—2 hours. Prerequisite: course 251 recommended. Study of selected problems of labor standards legislation.

253. Products Liability (2) I, Wilkerson
Discussion—2 hours. The civil action for harm to the consumer resulting from dangerous and defective products.

254. Developmental Legal History (2) II, Fessler
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) II, Juenger
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) II, Rabin
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) II, Juenger
Discussion—3 hours. A study of legal problems of European integration, including the transfer of powers to supra-national institutions, their decision making, the role of the Court of the Community and discussion of selected areas of Community law.

258. Legal Profession (1) I, Schwartz; II, Wydick
Discussion—1 hour. Study of the ethical duties and responsibilities of lawyers and lawyers under duties and responsibilities of the American Bar Association Code of Professional Responsibility, the California Rules of Professional Conduct, and the Code of Judicial Conduct. Required of all students prior to graduation. (S/U grading only.)

260. Employment Discrimination (2) II, Goldman
Discussion—2 hours. Discrimination in employment on the basis of race, color, religion, national origin, and sex. State laws will be discussed, as will labor relations laws, constitutional protections, and the Civil Rights Act of 1866. Course will focus on Title VII of the Civil Rights Act of 1964 and the affirmative action programs under Presidential Executive Orders. Students may elect to engage in specialized skills training in this field for an additional unit of credit on consent of instructor.

***261. Local Government** (2) I.
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) II, Wydick
Discussion—3 hours. Study of the federal antitrust laws including price fixing, limits on distribution, typing arrangements, monopolization and mergers.

263. Trial Practice I (2) I, Hogan
Lecture—thirty 2-hour blocks. Prerequisite: course 219A-219B, Evidence. Course features lectures, video tapes, and demonstrations aimed at exposing a student to litigational process in its entirety, but with special emphasis on the trial itself. Outside work will be minimal. Attendance will be taken and is mandatory for credit. (S/U grading only.)

264. Water Law (2) I, Dunning
Discussion—2 hours. Legal aspects of water resources management with emphasis on property systems in water, the development of new supplies, the transfer of water rights, groundwater management, and water pollution.

***265. Government Contracts** (1-2) II.
Discussion—1-2 hours. A study of the organization of the Federal Government with respect to acquisition and disposal of public property; expenditure of public funds; federal contracts as vehicles for carrying public policies into effect; making, administering, and terminating contracts; subcontracts; state power and federal contractors; remedies; brief analysis of California public contracts.

266. Law and Medicine (2) I, Schwartz and staff
Seminar—2 hours. Prerequisite: second-year medical students and second- and third-year law students with consent of instructor. A seminar approach emphasizing class

Law

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) II.

Seminar—1 hour. Prerequisite: course 230 recommended. Detailed consideration of selected problems in family law.

268. Taxation of Foreign Income (1-2) II. Simmons
Seminar—1-2 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. Jones

Discussion—2 hours. Study of selected consumer law problems, including a survey of state and federal regulatory efforts. Topics may be selected from, but not limited to, the following: consumer credit regulations, equal credit regulations, equal credit opportunity legislation, preservation of consumer defenses on fraud, deceptive advertising, product safety, consumer education, imprudent extension of credit. Each student will present one seminar session and write a paper on a subject within the seminar topic.

*271. Advanced Taxation Seminar (1-2) I.

Seminar—1-2 hours. A study of selected problems of public policy in relation to the tax law.

273. The Law and the Police (2) I. Feeney

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) I. 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) I. II

Discussion—2 hours. Prerequisite: course 226 or 227 recommended. From pre-sentence report through disabilities of ex-offenders with major emphasis on the lawyers' role vis-a-vis sentencing alternatives.

276. Juvenile Justice Process (2) II. Feeney

Discussion—2 hours. Legal and philosophical bases of a separate juvenile justice process; early stages in the juvenile justice process; investigation; apprehension; intake; detention; juvenile court hearings; juvenile corrections following disposition. Major emphasis 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. (3) I. Dyer

Discussion—3 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, determination of securities structure and dividend policy, and decisions on investment opportunities, whether by internal expansion or by merger or take-over. Consideration will also be given to the rights and remedies of minor security holders.

*278. Labor Law Seminar (1-2)

Seminar—1-2 hours. Study of selected problems in labor relations law.

279. Public Employee Bargaining (2) I. Goldman

Discussion—2 hours. The focus of this seminar will be on the development and operation of structured collective bargaining by public employees at the federal, state, and local levels.

280. Health Law Seminar (2) II. Miller

Seminar—2 hours. Detailed consideration of selected problems in health law.

281. Children and the Law (2) I. Bruch

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 Law (2) II. Love

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.

284. Consumer Credit. (2) I. Ayer

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' remedies, bankruptcy and consumer class actions. No other commercial law course is either a prerequisite or a bar to this one.

285. Environmental Law (2) II. Dunning

Discussion—2 hours. Problems of protecting the environment from public and private action: environmental impact statement procedures and other aspects of governmental decision making; control of air, water and noise pollution; regulation of land and resource use; roles of federal, state and local governments; private rights and remedies.

*286. Economics and the Law (1-2) I.

Seminar—1-2 hours. We examine a number of legal issues from the standpoint of some recent developments in economics. Possible topics include: the economic impact of liability rules; some economics of pollution control; and the purposes and impact of the antitrust laws. No prior background in economics is necessary, or even helpful.

288. Constitutional Law Seminar (2) II. Barrett

Seminar—2 hours. Prerequisite: courses 217 and 218. Study of selected problems in constitutional litigation.

*290. Criminal Justice Administration Seminar (1-2)

Discussion—1-2 hours. Prerequisite: course 226 or 227 recommended. Consideration of current reform efforts in criminal justice administration. Emphasis on the pre-trial process. Specific topics include bail reform, preventive detention, alternatives to arrest, and noncriminal methods for handling juveniles.

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; 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. Appellate Advocacy (2) I, II. The Staff

Laboratory—2 hours. Participation in intramural or extramural appellate moot court competition, including brief writing and oral argument. May be repeated once for credit. (S/U grading only.)

415. Trial Practice II (2) I, II. The Staff

Laboratory—2 hours. Prerequisite: course 263. Students form into teams to litigate mock civil and criminal trials. Following the pleading, discovery, and pre-trial motion stages, a jury trial is conducted. Students may elect to take this portion of the course twice, if the second trial is significantly different from the first. (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 director or the clinical committee and under the 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 two weeks 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, a student may enroll in no more than six units of individual clinical study. Four to five office hours are required per unit per week; full-time clinical semester (no other courses) for 12 units. A student may take one course in conjunction with a clinical semester with the consent of the Dean, but a student may receive credit for not more than 14 semester units during such a clinical 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 Deans' Office or Clinical Office. (S/U grading only, pending completion of sequence.)

430. Clinical Program in Civil Legal Services (3-5) I, II.

Clinical Program. Prerequisite: courses 210 and 289 recommended. This clinical course is designed to introduce students to the legal problems of the poor and the practice of poverty lawyering. Course work will consist of an initial and relatively short but intensive period of training to familiarize students with poverty law practice and litigation, followed by assignment, for one or two semesters to a legal aid office for a minimum of 10 office hours per week. 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. Students will also participate in seminar keyed to their poverty law practices. May be repeated for credit. (S/U grading only pending completion of sequence.)

450. Clinical Program in Environmental Law (2-6) I, II.

Clinical Program. Prerequisite: course 285 recommended. 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 7 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 weekly journal noting, commenting

upon, and reflecting upon their clinical experience. (S/U grading only, pending completion of sequence.)

460. Clinical Program in the Legislative Process (2-4) I.

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 a minimum of 7 office 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. If necessary, limited enrollment with preference given to third-year students. (S/U grading only.)

470. Clinical Program in the Administration of Criminal Justice (4-12) I, II.

Clinical Program. Prerequisite: courses 210, 219, 222, 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, pending completion of sequence.)

480. Legal Problems of the Prison Inmate (2-4) I, II.

Clinical Program. Prerequisite: consent of instructor; 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, and investigating and evaluating their cases for a minimum of 7 office hours per week. Seminar sessions are scheduled throughout the semester. (S/U grading only, pending completion of sequence.)

485. Street Law (4) I, II. Goodpaster

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.

495A-495B. Instruction in Legal Research and Writing (2-2) I-II. Lewis

Each participant in this course will be responsible for planning and carrying out a program of instruction in legal research and writing for a small group of first-year students. Enrollment limited and subject to approval of the professor in charge. (S/U grading only, deferred pending completion of sequence.)

Liberal Arts

(College of Letters and Science)

Program Office, 4208 Storer Hall

Committee in Charge

_____, Committee Chairperson
Margo R. Kaufman, M.A. (*French*)
Larry I. Peterman, Ph.D. (*Political Science*)

NOTE: For key to footnote symbols, see page 132.

The Major Program

This major is intended for students who have cross-disciplinary or strong interdisciplinary interests and who wish to be introduced systematically to a number of intellectual disciplines and styles. The major is also intended for students interested in a postgraduate professional education for which a departmental major is not required. The major consists of a series of core sequences on the lower division level followed by a rigorous, individually planned upper division program. For transfer students, adjustments in lower division requirements may be allowed by the Committee in Charge.

Liberal Arts

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	37-73
English and rhetoric, Rhetoric 1 and one course from English 1, 2, 3, 4A, 4B	8
Foreign language, one language through the intermediate level	0-18
Humanities, History 4A, 4B, 4C	12
Recommended: one course sequence from the following three: (a) Philosophy 21, 22, 23; (b) English 46A, 46B, 46C, or (c) 30A, 30B, 30C. Three courses from Art 1A, 1B, 1C, 1D, Music 27A, 27B, or for students with previous musical training, Music 4A, 4B, 4C or 21A, 21B, 21C.	
Natural Science and mathematics, select one category from the following five:	9-21
(a) Mathematics 16A, 16B, 16C	
(b) Chemistry 1A, 1B, 1C	
(c) Physics 2A, 2B, 2C	
(d) Chemistry 1A, 1B, Biological Sciences 1, and Bacteriology 2 or Botany 2 or Zoology 2	
(e) Geology 1, 3, 16; and either 1L or 3L	
Social science, select one category from the following four:	8-14
(a) Economics 1A, 1B	
(b) Three courses from Political Science 2, 3, 4, 5	
(c) Anthropology 2, Sociology 1, 3	
(d) Psychology 1, 15, 16	
Depth Subject Matter	45-49
At least 12 upper division units in each of two departments	24
Upper division units of independent study, at least 15 of which must be completed in the senior year	21-25
Total Units for the Major	82-112

In consultation with his or her adviser, each student shall propose a plan of upper division course work which will satisfy his general educational objectives and meet the major requirements. It must be approved by both the student's adviser and the committee in charge of the major no later than the end of the student's junior year.

Major Adviser. See *Class Schedule and Room Directory*.

Linguistics

(College of Letters and Science)

Program Offices, 4208 Storer Hall and 912 Sproul Hall

Committee in Charge

Wilbur A. Benware, Ph.D. (*German*), Committee Chairperson
Marianne Cooley, Ph.D. (*Linguistics, English*)
Richard A. Ogle, Ph.D. (*Linguistics*)
²Lenora Timm, Ph.D. (*Linguistics*)
Máximo Torreblanca, Ph.D. (*Spanish*)

Faculty

Ronald A. Arbini, Ph.D., Associate Professor (*Philosophy*)
Jarvis R. Bastien, Ph.D., Professor (*Psychology*)
Wilbur A. Benware, Ph.D., Assistant Professor (*German*)
Marianne Cooley, Ph.D., Assistant Professor (*Linguistics, English*)
Linnea C. Ehri, Ph.D., Associate Professor (*Education*)
James Gallant, Ph.D., Assistant Professor (*Russian*)
Wayne Harsh, Ph.D., Professor (*Linguistics, English*)
Larry H. Hillman, Ph.D., Assistant Professor (*French*)
Richard A. Ogle, Ph.D., Assistant Professor
David L. Olmsted, Ph.D., Professor (*Anthropology*)
Anne-Louise Radimsky, Ph.D., Assistant Professor (*Electrical Engineering*)
Winfried Schleiner, Ph.D., Associate Professor (*English*)
Gwendolyn Schwabe, M.A., Lecturer (*English*)
Lenora Timm, Ph.D., Assistant Professor
Máximo Torreblanca, Ph.D., Assistant Professor (*Spanish*)
Carol F. Wall, Ph.D., Associate Professor (*Anthropology*)
Benjamin E. Wallacker, Ph.D., Professor (*Oriental Languages*)

The Major Program

Linguistics focuses on the structure of human language, which consists of interlocking systems of sounds, grammatical units, sentences, and meanings. The major is designed to familiarize students with these aspects of language, at gradually accelerated levels of methodological and theoretical complexity through a specially designed sequence of "core" courses.

Electives in the program will permit the student to explore areas and issues overlapping with linguistics, such as the relation of language to cognition, language in its social context, the acquisition of language by children, etc. The program should also be attractive to students interested in learning or teaching particular languages.

Linguistics

A.B. Requirements:

	UNITS
Preparatory Subject Matter	12-22
Linguistics 35 or 135	4
Foreign Language: Oriental Languages 100 and Anthropology 220; or three quarters of study in one or more specific non-Indo European language	8-18
Depth Subject Matter	40
Linguistics 109, 110, 112; 139, 140; 111 or 165	24
At least 16 upper division units from the following courses: Anthropology 120; English 105A, 105B; French 160; Human Development 100A, 101; Linguistics 105, 106, 107, 114, 135 (if not used as an alternate to course 35	

Mass Communication

above), 146, 150, 165; Philosophy 137;
Psychology 132A, 132B, 180G; Spanish 131,
132 16

Total Units for the Major 52-62

Major Advisers. M. Cooley, W. Harsh, R. A. Ogle,
L. Timm, C. F. Wall.

Graduate Study. Requirements for the M.A. degree are 30 units in addition to a thesis plus a reading knowledge of German, French, Russian, or a language approved by the Committee. The courses must be graduate courses or upper division undergraduate courses. At least 12 of the 30 units must be strictly graduate work in the major subject. The following courses, or the equivalent, are specifically required: Linguistics 139, 140, 202, 225. Graduate courses in related departments that candidates may take include the following: Anthropology 220; English 205, 207, 208; French 201A, 201B, 230; German 201, 202; Linguistics 200, 203, 205; Psychology 264; Russian 200, 202, 204; Spanish 220A, 220B.

Graduate Advisers. M. Cooley, D. L. Olmsted, L. Timm.

COURSES IN LINGUISTICS

Lower Division Course

35. Introduction to Linguistics (4) I, III. Ogle, Timm
Lecture—3 hours; laboratory—2 hours. Introduction to the study of language; its nature, diversity, and structure.

Upper Division Courses

105. Linguistics Analysis of German (4) II. Benware
Lecture—3 hours; assigned problem sets. The descriptive study of modern German with consideration of its structural differences from English. (Same course as German 105.)

***105C. Language Change Reflected in Literature** (4) II, III. Harsh, Campbell
Lecture—3 hours; term paper. 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 linguistic periods. (Same course as English 105C.)

106. History of the German Language (4) III. Moelleken
Lecture—3 hours; written reports. Survey of the development of the German language, and study of its structure in historical perspective. (Same course as German 106.)

107. Special Topics in English Language (4) III. Schleiner, Cooley, Harsh
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.)

110. Elementary Linguistics Analysis (4) II, III. Olmsted, Wall
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 Linguistics 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.)

114. The Ethnography of Speaking (4) I, Timm
Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2; Anthropology 4 or course 35. 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.)

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 35.)

138. Language Development (4) III 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. Cooley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. Introduction to and application of phonological theory.

140. Grammatical Analysis (4) III 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 in 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. Timm
Lecture—3 hours; discussion—1 hour. Prerequisite: Spanish 3 (or the equivalent) and either course 35, 110, or 135. Comparison of the linguistic structures of English and Spanish with emphasis on problems of the Spanish-speaker learning English. Analysis of the role of the school and the sociolinguistic situation of Spanish-speakers in California and the Southwest.

165. Introduction to Generative Grammar (4) II. Ogle
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 35 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, III. Harsh
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.)

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 (Harsh in charge)

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. (Same course as German 200.) Offered in even-numbered years.

202. Principles of Historical Linguistics (3) II. Benware, Cooley
Lecture—3 hours. Prerequisite: course 112. Advanced treatment of the theory and method of historical linguistics.

203. Old Saxon (4) III. Moelleken
Seminar—3 hours. Knowledge of Modern German not required. Study of the linguistic structure and the literary significance of the language of the Old Saxon *Heiland*. Offered in even-numbered years. (Same course as German 203.)

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.)

209. Historical Germanic Linguistics (4) II. Benware
Seminar—3 hours. The principles and techniques of historical linguistics will be used to study the development of the Germanic languages from Proto-Indo-European through Proto-Germanic and into early Germanic dialects such as Old Norse, Gothic, Old Saxon, and Old English. (Same course as German 209.)

***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) II. Hillman, Ogle
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. Option of focus on phonology, syntax, or historical linguistics.

225. Modern Linguistic Theory (3) III. Ogle
Lecture—3 hours. Prerequisite: courses 111 and 140. Survey of leading contributions to linguistic theory from de Saussure to the present.

299. Research (1-12) I, II, III. The Staff (Harsh in charge) (S/U grading only.)

Professional Course

300. The Teaching of English as a Foreign Language (4) II. 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.

Mandarin

See Oriental Languages

Mass Communication

(College of Letters and Science)

Program Office, 4208 Storer Hall

Committee in Charge

Everard d'Harnoncourt, Ph.D. (*Dramatic Art*)
Committee Chairperson
Sidney Berger, Ph.D. (*English*)
Edmond Costantini, Ph.D. (*Political Science*)

William Henderson, M.F.A. (Art)
Travis Hirschi, Ph.D. (Sociology)

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 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. The student should plan to take those courses needed to satisfy prerequisites for upper division requirements in the major program.	
Depth Subject Matter	36-52
At least 36 upper division units, selected in consultation with a major adviser, to include:	
Four courses from one of the five topic areas shown below, and four courses distributed among at least two of the remaining topic areas	28-36
Two-unit seminar for majors (to be taken once each year in the junior and senior years)	4
Senior project related to area of concentration	4-12
The project might entail research into a facet of mass communication content, policy, or effects, or involve some form of creative activity that culminates in some artifact, for example, a film, video tape, or script.	
Total Units for the Major	36-52

Topic Areas

(a) Communication Theory

Required: at least one course from Psychology 145; Rhetoric 100, 114, 130. Additional courses: Anthropology 120; Psychology 132A, 132B; 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; Political Science 156, 157A; Rhetoric 122; Sociology 148.

(c) Social Science Research Methods

Philosophy 109; Political Science 111; Psychology 103, 107; Rhetoric 153; Sociology 106.

(d) Production of Media Content

Art 110, 115, one course from 125, 126, 127, 128, or 129; Dramatic Art 124A or 124B or 124C, 127A, 160A; English 100F or 100P, 103, 184; Rhetoric 250.

(e) *Analysis of the Content and Effects of Mass Communication*

Art 147, 148; Dramatic Art 115; English 183; Philosophy 123; Political Science 164; Rhetoric 141; Sociology 175.

Senior Project. Each student's program of upper division courses and senior project must be approved by an advisory committee. The committee may refuse a proposed senior project, if in its opinion the student lacks the substantive or methodological background needed for successful completion of the project. Completed projects must be submitted to the committee for approval no later than the fifth week of the quarter in which the student plans to graduate.

Major Advisers. Members of the Committee.

Mathematics

(College of Letters and Science)

David Mead, Ph.D., Chairperson of the Department

Howard J. Weiner, Ph.D., Vice-Chairperson of the Department

Department Office, 565 Kerr Hall

Faculty

⁴Henry L. Alder, Ph.D., Professor
Hubert A. Arnold, Ph.D., Associate Professor
Corwin L. Atwood, Ph.D., Assistant Professor
George A. Baker, Ph.D., Professor Emeritus
Dallas O. Banks, Ph.D., Professor
David W. Barmette, Ph.D., Professor
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
William J. Conover, Ph.D., Visiting Professor
Doyle O. Cutler, Ph.D., Associate Professor
James R. Diederich, Ph.D., Associate Professor
Allan L. Edelson, Ph.D., Associate Professor
²Alan P. Fenech, Ph.D., Assistant Professor
⁴Curtis M. Fulton, Ph.D., Professor
Ronald E. Glaser, Ph.D., Assistant Professor
Robert D. Glauz, Ph.D., Professor
Aaron S. Goldman, Ph.D., Visiting Professor
Shirley A. Goldman, M.S., Lecturer
Charles A. Hayes, Jr., Ph.D., Professor
Kurt Kreith, Ph.D., Professor
Arthur J. Krener, Ph.D., Associate Professor
Melvin R. Krom, Ph.D., Professor
^{3,4}Gary J. Kurowski, Ph.D., Professor
Peter Linz, Ph.D., Associate Professor
Norman S. Matloff, Ph.D., Assistant Professor
David G. Mead, Ph.D., Professor
E. O. Milton, Ph.D., Associate Professor
^{3,4}Donald A. Norton, Ph.D., Associate Professor
Washek F. Pfeiffer, Ph.D., Professor
Richard E. Plant, Ph.D., Assistant Professor
Edward B. Roessler, Ph.D., Professor Emeritus
G. Thomas Sallee, Ph.D., Professor
Francisco J. Samaniego, Ph.D., Assistant Professor
⁴Evelyn M. Silvia, Ph.D., Assistant Professor
³Sherman K. Stein, Litt.D. (hon.), Ph.D., Professor

Robert W. Stringall, Ph.D., Associate Professor
²Takayuki Tamura, D.Sc., Professor
¹Edward 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 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 bachelor 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	23-25
Mathematics 11 (or high school equivalent)	0-2
Mathematics 21A, 21B, 21C, 22A, 22B, 22C, 24	23
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	59-61

Mathematics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	23-25
Mathematics 11 (or high school equivalent)	0-2
Mathematics 21A, 21B, 21C, 22A, 22B, 22C, 24	23
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	68-70

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, but 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, 197T, 198, and 199 courses are not appropriate to be applied towards this requirement;

NOTE: For key to footnote symbols, see page 132.

Mathematics

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, H. A. Arnold, D. C. Benson, R. J. Buck, G. D. Chakerian, D. O. Cutler, J. R. Diederich, A. L. Edelson, R. E. Glaser, R. D. Glauz, A. J. Krener, E. O. Milton, W. F. Pfeffer, H. J. Weiner.

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 application of mathematics to the biological or social sciences, computer science or statistics may contact the appropriate special area adviser.

Applied Mathematics. Recommended career preparation: Most programs include Mathematics 19 or 29, 118A, 118B, 120, 128A, 128B, 128C and 139C. 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.

Special Area Advisers—Applied Mathematics: J. R. Diederich (Applied Analysis), R. E. Plant (Biological Science), R. D. Glauz (Computer Science), G. T. Sallee (Social Science), A. J. Krener (Systems Theory).

Statistics. Statistics is used extensively in research in the biological, social, and physical sciences, and in other areas, such as econometrics and engineering.

Concentration in Statistics: Undergraduate mathematics majors who wish to concentrate in statistics should take the following courses: Mathematics 29, 32, 105A-105B, 131A-131B-131C (or 130A-130B, with the consent of adviser), 135; at least three quarters from Mathematics 132A-132B, 133, 134, 144, or, with consent of the adviser, statistics courses from other departments; at least two quarters of 127A-127B-127C, 128A-128B-128C, 129A-129B, or 168.

Graduate Study in Statistics: Graduate students who wish to concentrate in statistics should contact the graduate studies adviser. Information concerning careers in statistics is available from statistics advisers.

Statistical Consulting: Those engaged in research on campus may contact the Mathematics Department for information concerning statistical consulting.

Department Statistics Course Offerings: Mathematics 13, 32, 105A-105B, 130A-130B,

131A-131B-131C, 132A-132B, 133, 134, 144, 231A-231B-231C, 232A-232B, 233, 235A-235B-235C, 236A-236B-236C.

Statistics Course Offerings Outside Department: Several departments offer undergraduate or graduate courses in statistics. A list of these courses is available at the Mathematics Department.

Statistics Advisers: C. L. Atwood, A. P. Fenech, R. E. Glaser, N. S. Matloff, F. J. Samaniego, H. J. Weiner.

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, 139C and 141 are essential; a selection from courses 13, 19 (or 29), 36, 112, 114, 115A, 128A, 128B, 128C is highly recommended.

Teaching Credential Subject Representative. R. W. Stringall. See page 107 for the Teacher Education Program.

Qualifying Examinations. A student entering from high school who believes that he or she has had the equivalent of a course offered by the Department of Mathematics (e.g., analytic geometry and calculus) may demonstrate proficiency in this course by examination. If, in the opinion of the department, the student's level of achievement is sufficiently high, he or she will be permitted to enter the next course in sequence. No University credit is earned by passing such an examination. Arrangements for an examination must be made with the Department secretary on or before the Monday of registration week.

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. C. L. Atwood, D. O. Banks, C. R. Borges, P. Linz, G. T. Sallee, S. K. Stein.

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. (There is a fee of \$45.) (P/NP grading only.)

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. (There is a fee of \$30.) (P/NP grading only.)

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 courses 13, 16A, or 21A. Functions, equations, graphs, logarithms, systems of equations, and trigonometric functions. Offered only if sufficient number of students enroll. (There is a fee of \$45.) (P/NP grading only.)

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. Not open to students who have received credit for course 16A.

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; non-parametric statistics; regression and correlation theory. (Students having had courses 130A or 131A may not take course 13 for credit.)

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 in course 21A. Only 2 units of credit allowed students who have received credit for course 11. A short course in analytic geometry and differential and integral calculus. Not recommended for students who may 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 in 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. Only 1 unit of credit will be allowed to students who have received credit for course 21B. Continuation of course 16B.

19. Basic Concepts of Computing (3) I, II, III, Kurowski, Linz, Glauz
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 high school algebra, plane geometry, plane trigonometry, and analytic geometry. Functions, differentiation, computation of derivatives, maximum and minimum problems, applications of differentiation.

21AH. Honors Calculus (4) I, Stein
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. Continuation of course 21A. The definite integral, fundamental theorem of calculus, techniques of integration and applications to areas and volumes. L'Hôpital's rule, improper integrals, and parametric equations.

21BH. Honors Calculus (4) II, Mead
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 consent of instructor. Continuation of course 21B. Definite integrals over multidimensional regions, partial derivatives and extrema, differentials and chain rule for functions of several variables, directional derivatives and gradients, algebraic operations on vectors.

21CH. Honors Calculus (4) III, Stein
Lecture—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, deter-

minants, complex numbers, quadratic forms. (Courses 22A, 22B, 22C may be taken in any order. However, if enrolled in Physics 4 sequence, 4C, 4D, 4E, courses should be taken in reverse order, 22C, 22B, 22A.)

22AH. Honors Linear Algebra (3) I, Milton
Lecture—3 hours. Prerequisite: course 21CH or consent of instructor. Honors course covering the material of 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. Milton
Lecture—3 hours. Prerequisite: course 22CH. Honors course covering material of course 22B.

22C. Vector Analysis (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 21C. Green's theorem, Stokes' theorem, divergence theorem.

22CH. Honors Vector Analysis (3) III. Milton
Lecture—3 hours. Prerequisite: course 22AH. Honors course covering material of course 22C.

24. Infinite Series (2) II, III. The Staff
Lecture—2 hours. Prerequisite: course 21C (may be taken concurrently). Elements of infinite series including Fourier series and series with complex terms.

29. Introduction to Computer Science (3) I, Milton
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.

32. Basic Statistical Analysis Through Computers (3) II. Matloff

Lecture—3 hours. Prerequisite: course 16B or 21B; course 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.

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. Barnette
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) I, 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-aide. (Deferred grading only, pending completion of course 71A-71B sequence.)

71B. Elementary Mathematics and Its Instruction (3) II, 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 (Mead in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Survey of Contemporary Mathematics (2) II. Chakerian
Lecture—2 hours. Prerequisite: course 21C. An introduc-

tion to modern mathematics, its methods and applications, including the relationship between pure and applied mathematics. (P/NP grading only.)

105A. Applied Statistical Methods: Analysis of Variance (4) II, III. Fenech, Goldman
Lecture—4 hours. Prerequisite: course 13. Design of experiments including randomized complete block designs, Latin squares, split-plot designs, factorial designs, and incomplete block designs.

105B. Applied Statistical Methods: Multiple Regression (3) III. Fenech, Goldman
Lecture—3 hours. Prerequisite: course 105A or knowledge of analysis of variance. Multiple regression and analysis of covariance.

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, Fulton
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. Chakerian
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. Barnette
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. Barnette
Lecture—3 hours. Prerequisite: course 108A. Continued fractions, partitions. Offered in even-numbered years.

116. Metric Differential Geometry (3) III. Chakerian
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. Diederich
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C, 24. 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. Diederich
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, Diederich
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C, 24. 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, 24. Analysis of functions of one complex variable. Laplace transforms, and applications.

***125. Introduction to Mathematical Logic** (3) I, Krom
Lecture—3 hours. Prerequisite: course 108A or consent of instructor. Propositional calculus, predicate calculus, normal forms, completeness. Offered in odd-numbered years.

126. Introduction to the Theory of Sets (3) II. Krom
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. Pfeffer
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, Banks, Krener
Lecture—3 hours; laboratory—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. Banks, Krener
Lecture—3 hours; laboratory—1 hour. Prerequisite: course 22A, and course 29 or a knowledge of FORTRAN or ALGOL. Solution of non-linear equations, simultaneous equations, eigenvalues, linear programming.

128C. Numerical Analysis in Differential Equations (4) III. Banks, Krener
Lecture—3 hours; laboratory—1 hour. Prerequisite: courses 22A, 22B, and course 29 or a knowledge of FORTRAN or ALGOL. Difference equations, operators, numerical solution of differential equations, partial differential equations.

129A. Introduction to the Theory of Programming (3) II. Linz
Lecture—3 hours. Prerequisite: course 22A, 29 (or the equivalent). Assembly languages; arrays and lists; data processing algorithms.

129B. The Theory and Structure of Computer Languages (3) III. Linz
Lecture—3 hours. Prerequisite: course 129A. Theory of compilers; structure of computer languages, their limitations and ambiguities; study of a particular language.

130A-130B. Mathematical Statistics, Brief Course (4-4) I-II. Samaniego, Conover
Lecture—3 hours; discussion—1 hour. Prerequisite: course 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, Kreith, Weiner
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 22A and 24. 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, Atwood; III, Kreith
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.

132A-132B. Introduction to Stochastic Processes (3-3) II, III. Krener
Lecture—3 hours. Prerequisite: course 131A. Random walks, recurrent events, Markov chains, birth-and-death processes.

***133 Probabilistic Models in Operations Research** (3) I. The Staff
Lecture—3 hours. Prerequisite: course 130B or 131B. 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.

***134. Nonparametric Inference** (3) II. Fenech
Lecture—3 hours. Prerequisite: course 130B or 131B. Selected topics in nonparametric statistical inference from

NOTE: For key to footnote symbols, see page 132.

Mathematics

a one-sample and a k-sample point of view. Topics include Kolmogorov-Smirnov type tests; confidence intervals for quantiles, locations and scale parameters; rank tests, dispersion tests, efficiency. Offered in odd-numbered years.

135. Multivariate Data Analysis (3) III. Conover
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.

***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-139B-139C. Introduction to Algebra (3-3-3) I-II-III. Stein

Lecture—3 hours. Prerequisite: courses 22A and 108A; or consent of instructor. Not open for credit to students who have received credit in course 151A without consent of Department, and may not be taken concurrently with 151A. Theory of equations, symmetric functions, vector space aspects of Galois theory, Euclidean rings, integers in the quadratic fields.

***140. Applications of Mathematics** (3) III. Sallee
Lecture—3 hours. Prerequisite: course 108A. Applications of algebra, geometry and analysis in the natural, social and physical sciences.

141. Euclidean Geometry (3) II. Sallee
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.

***144. Sampling Theory of Surveys** (3) II. Fenech
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. Problems of nonresponse. Offered in even-numbered years.

147. Topology (3) II. Edelson
Lecture—3 hours. Prerequisite: course 127C, and 151A or 139A-139B. Basic notions of point-set and combinatorial topology. Offered in odd-numbered years.

151A-151B-151C. Algebra (4-4-4) I-II-III. Borges
Lecture—3 hours; extensive reading and problem solving. Prerequisite: course 108A. Introduction to groups, rings, fields and linear transformations.

168. Linear Programming and Game Theory (3) I, Sallee
Lecture—3 hours. Prerequisite: course 21C or 15. Introduction to zero-sum, two-person games; the fundamental theory for matrix games; basic concepts of linear inequalities; and duality theorem; the simplex method. Offered in even-numbered years.

185A-185B. Functions of a Complex Variable (3-3) I, II. Silvia
Lecture—3 hours. Prerequisite: courses 22C, and 24. Complex number systems, Cauchy-Riemann equations, elementary functions, Cauchy integral theorem, power series, Laurent series, residue theorem, conformal mapping, special topics.

197T. Tutoring in Mathematics (1-4) I, II, III. The Staff (Mead 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 (Mead in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Mead in charge)
(P/NP grading only.)

Graduate Courses

201A-201B-201C. Real Analysis (3-3-3) I-II-III. Chakerian
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. Benson
Lecture—3 hours. Prerequisite: course 127C. Theory of analytic functions, Cauchy integral theorem, power series, analytic continuation, conformal mapping, special functions.

210A-210B-210C. Topics in Algebra, Analysis and Geometry (3-3-3) I-II-III. Barnette
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. Required in the M.A. program for prospective teachers. (Course 210A, 210B, 210C series may be repeated for credit with prior consent of instructor.)

215A-215B-215C. Topology (3-3-3) I-II-III. Edelson
Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Topics selected from point-set topology and homotopy theory.

218A-218B. Partial Differential Equations (3-3) I-II. Diederich
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. Benson
Lecture—3 hours. Prerequisite: courses 22A and 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. Plant
Lecture—3 hours. Prerequisite: courses 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.

***225A-225B. Metamathematics** (3-3) II-III. Krom
Lecture—3 hours. Prerequisite: courses 151A and either 125 or Philosophy 12A-12B; or consent of instructor. Formalizability, consistency, and completeness of the formalized mathematical theories; definability in formal languages; topics from the theory of models. Offered in even-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. Glauz
Lecture—3 hours. Prerequisite: course 128C. Numerical solution 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. Glauz
Lecture—3 hours. Prerequisite: consent of instructor. Computational methods and theoretical aspects in 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.

231A-231B-231C. Mathematical Statistics (3-3-3) I-II-III. Glaser
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. Matloff
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. Atwood
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.

***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, laws of large numbers and central limit theorems, conditional probabilities, martingales. Offered in odd-numbered years.

***236A-236B-236C. Advanced Mathematical Statistics** (3-3-3) I-II-III. Samaniego
Lecture—3 hours. Prerequisite: course 231C. Statistical theory of invariance, robustness sequential analysis, non-parametric theory. Offered in odd-numbered years.

***240A-240B-240C. Differential Geometry** (3-3-3) I-II-III. Krener
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. Tamura
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. Cutler
Lecture—3 hours. Prerequisite: graduate standing in mathematics or consent of instructor. Normal sub-groups 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 semi-groups, quasigroups, and groups.

290. Seminar (1-6) I, II, III. The Staff (Mead in charge)
Advanced study in various fields of mathematics, including the following: algebraic theory of semi-groups, control theory, mathematical logic, mathematical statistics, ordinary differential equations, partial differential equations, theory of distributions, and univalent functions. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Mead in charge)

299. Individual Study (1-6) I, II, III. The Staff (Mead in charge)
(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Mead in charge)
(S/U grading only.)

300A. The Teaching of Mathematics, K-9 (1-1-1) I, 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 in the 3-quarter sequence must be made at the beginning of the Fall Quarter through the Education Department. (Deferred grading only in the 3-quarter sequence.)

***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 Learning Resources

See Medicine

Medical Microbiology

See Medicine

NOTE: For key to footnote symbols, see page 132.

Medicine

School of, this page; **Medicine (Veterinary Medicine)**, see page 256.

Medicine

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William McFarland, M.D., Assistant Dean
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- Wallace D. Winters, M.D., Ph.D., Professor (*Internal Medicine, Pharmacology*)
- Earl F. Wolfman, Jr., M.D., Professor (*Surgery*)
- David E. Woodruff, Jr., M.D., Assistant Professor in Residence (*Internal Medicine*)
- Julian R. Youmans, M.D., Ph.D., Professor (*Neurological Surgery*)
- Jean A. Zellé, M.Ed., Lecturer (*Physical Medicine and Rehabilitation*)

Admission Requirements and Professional Curriculum. Detailed information can be obtained from the *School of Medicine Bulletin*. See also pages 110 and 121.

NOTE: For key to footnote symbols, see page 132.

Medicine

COURSES IN THE SCHOOL OF MEDICINE

Departmental Courses

Anesthesiology

Professional Courses

420. Case Management Conference (1) I, II, III, IV Asling and staff

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. (H/S/U grading only for medical students.)

421. Basic Science Conference (1) I, II, III, IV Reitan and staff

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. (H/S/U grading only for medical students.)

490. Resident Seminar (1) I, II, III, IV Carnes and staff

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 (H/S/U grading only for medical students.)

499. Anesthesiology Research (1-6) I, II, IV Eisele and staff

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. (H/S/U grading only for medical students.)

Behavioral Biology

Lower Division Courses

98. Directed Group Study (1-3) I, II, III, IV The Staff (Chapman in charge)

Discussion—1-3 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 (1-3) I, II, III, IV The Staff (Chapman in charge)

Discussion—1 hour; laboratory—2-4 hours. 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 (1-3) I, II, III, IV The Staff (Chapman in charge)

Discussion—1-3 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.)

199. Special Study for Advanced Undergraduates (1-3) I, II, III, IV. The Staff (Chapman in charge)

Discussion—1 hour; laboratory—2-4 hours. 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 problems. (P/NP grading only.)

Graduate Courses

245. Psychophysiology of Stress (3) II Sassenrath

Lecture—1 hour; discussion—2 hours Prerequisite consent of instructor. Neuroendocrine stress response systems, feedback control and hormonal interrelations. Hormonal and behavioral effects of chronic psychosocial or environmental stress. Stress interaction with CNS control of affect, sexual function and drug responses The material covered will be of general interest, but will have special relevance to students with primary interest in medicine, social behavior, sociobiology, or environmental studies

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

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 problem (SU 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 (Deferred grading pending completion of course; H/S/U grading only for medical students; S/U grading only for graduate students.)

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 (H/S/U grading only for medical students; 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 (Krebs 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; open to graduate students 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; open to graduate students. A series of lectures on current topics of biochemistry related to medicine. The 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, Doi

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. (H/S/U grading only for medical students; S/U grading only for graduate students.)

235. Biochemical Mechanisms of Mammalian Hormones (4) I, Walsh, Wilson, Geschwind

Lecture—3 hours; discussion—1 hour Prerequisite: Biochemistry 201A-201B-201C or consent of instructor or Medical Sciences 410; open to graduate students. 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 odd-numbered years. (H/S/U grading only for medical students.)

290. Current Topics in Biological Chemistry (1) I, II, III. The Staff (Krebs in charge)

Seminar—1 hour. Prerequisite: previous course in biochemistry; open to graduate students. 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; open to graduate students Review of current research in structure and function of bacterial and mammalian ribosomes and control of protein synthesis. (Same course as 491) (S/U grading only for graduate students; H/S/U grading only for medical students.)

298. Group Study (1-5) I, II, III, IV. The Staff (Krebs 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 (Krebs in charge)

Prerequisite consent of instructor. (S/U grading only.)

Professional Courses

490. Current Topics in Biological Chemistry (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: course in biochemistry or molecular and cell biology. 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 course as 290.) (H/S/U grading only for medical students.)

491. Current Topics in Protein Synthesis (1) I, II, III, IV

Traut, Hershey
Discussion-seminar—1 hour. Prerequisite: consent of instructor; open to graduate students. Review of current research in structure and function of bacterial and mammalian ribosomes and control of protein synthesis. (Same course as 291.) (S/U grading only for graduate students; H/S/U grading only for medical students.)

Clinical Psychology

Graduate Courses

200. Theory of the Person-Adult (4) I, Meadow

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 Meadow and staff

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) 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, Meadow and staff

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

Morrison and staff
Lecture—3 hours. Prerequisite: consent of instructor. Detailed 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. Theories of the Group (4) III, Kemp and staff

Lecture—2 hours; seminar—2 hours. Prerequisite: consent of instructor. A review of the literature in culture and personality and organizational theory relevant to problems of assessment and intervention in community and group processes. (S/U grading only.)

207. Theories of Group Consultation (3) III, Greene

Seminar—3 hours. Prerequisite: course 208 (concurrently) and consent of instructor. A sociopsychological approach towards the study of the interrelationships among the individual, group and organization. Review of such concepts as role and personality, individual and group boundaries, leadership, and authority. Applications to models of small group and social system consultation. (S/U grading only.)

208. Practicum in Group Consultation (3) III, Morrison

Seminar—3 hours. Prerequisite: course 207 (concurrently) and 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. (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) II, Abramowitz

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) III, Abramowitz

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 research will be reviewed.

214. Psychotherapy Practicum (3) I, Folkins, Kemp

Discussion—1½ hours; clinical field placement—6 hours. Prerequisite: psychology graduate students or consent of instructor. Supervision and discussion of clinical cases within the framework of specific models of psychotherapy. (S/U grading only.)

215. Assessment Practicum (1-3) I, II, III, Wahba

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 permission of the instructor offering supervision. Students will also write assessment reports including their interpretation of test results and have them discussed with supervisor. (P/NP grading only.)

216. Psychological Assessment I. (3) I, Wahba

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.

217. Introduction to Projective Assessment (3) II, Bell

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. (Deferred grading only, pending completion of course.)

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, III, Kraus, Borhani, 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 (2) III, Kraus, Borhani

Lecture—2 hours. Prerequisite: upper division undergraduate or graduate with interest in health sciences, human ecology, or related areas. Focus on principles of medical ecology as they relate to the study of the distribu-

tion 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. Environmental Health (4) II, Kraus

Lecture—3 hours; discussion—1 hour. Contemporary problems in environmentally dependent aspects of individual and public health. Disease associated with pollution of air, water, soil, food; infectious diseases such as malaria, and encephalitis; and stress phenomena related to urban crowding, noise, and occupation will be considered. (Same course as Environmental Studies 126.)

198. Directed Group Study (2) I, II, III, The Staff (Bauer in charge)

Discussion—2 hours. Prerequisite: consent of instructor. Humanism in medicine. Discussion of humanistic aspects of various topics of community health such as health care delivery, right to die, suicide, sexuality, rights of children, etc. (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. (H/S/U grading only for medical students.)

202. Community and Preventive Medicine (1-9) I, II, III, IV, Kraus, Borhani, and staff

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. (H/S/U grading only for medical students.)

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. (H/S/U grading only for medical students.)

204. Medical and Health Care Delivery Patterns (3) II, III, Borhani, 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. (H/S/U grading only for medical students.)

205. Issues in Community Health (2) I, II, Bauer, Borhani, 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. (H/S/U grading only for medical students.)

206. Nutrition and Health (2) II, Borhani, Kraus

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. (H/S/U grading only for medical students.)

226. Psychiatric Implications of Legal Intervention (2)

I, III, Bauer, Tupin, Schuller

NOTE: For key to footnote symbols, see page 132.

Medicine

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.)

290. Current Topics in Community Health (1-3) I, II, III, IV. Borhani, Kraus

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. (H/S/U grading only for medical students.)

298. Group Study in Community Health (1-9) 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. (H/S/U grading only for medical students.)

299. Research in Community Health (1-9) 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. (H/S/U grading only for medical students.)

Family Practice

Upper Division Courses

120A-120B. Fundamentals of Medicine for Family Nurse Practitioners (10-10) II, III. Fenley, Chaykin, Andrus

Lecture—5 hours; discussion—1 hour; laboratory—12 hours. Prerequisite: student in Family Nurse Practitioner Program not pursuing a master's degree. Instruction and practice in the fundamentals of interview technique, taking a medical history, use of the problem oriented medical records, and performing a complete physical examination.

120C-120D. Fundamentals of Medicine for Family Nurse Practitioners (10-10) IV, I, Morgan, Judson

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.

121A-121B. Introduction to Community Health for Family Nurse Practitioners (2-2) II, III. Chaykin, Mentink, Fenley

Seminar—2 hours. Prerequisite: students in Family Nurse Practitioner Program not pursuing a master's degree. Discussion of principles of community health and components of the health care system.

121C-121D. Fundamental Issues for Family Nurse Practitioners (2-2) IV, I, 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, Smilkstein

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.

198. Directed Group Study (1-5) I, II, III, IV. Andrus, Smilkstein

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 (Geyman, Smilkstein 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

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; open to graduate students. 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.) (H/S/U grading only for medical students.)

*271. Clinical Pharmacology (2-10) I, II, III, IV. Winters, Renolett

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. Geyman and staff

Hours to be arranged. Prerequisite: consent of instructor; open to graduate students. Special study for graduate students to explain selected areas of primary care and the health care delivery system. (S/U grading only.)

Professional Courses

406A-406B-406C. Primary Care in Sports Medicine (2,2,2) I, II, III. Smilkstein

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. (H/S/U grading only for medical students.)

410. Analysis of Health Care Delivery Systems for Family Nurse Practitioners (4) II, III. Schwartz, Andrus

Lecture—3 hours; discussion—1 hour. Prerequisite: students in the Family Nurse Practitioner Program. Topics aimed at providing a theoretical understanding of the economics and organization of health care systems, quality of care, legislation and licensure, and the role of family nurse practitioners. (S/U grading only.)

411. Family Structure and Function for Family Nurse Practitioners (4) III, IV. Hawkes, Fenley

Lecture—2 hours; discussion—2 hours. Prerequisite: students in the 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. (S/U grading only.)

420A-420B. Advanced Clinical Medicine for Family Nurse Practitioners (5-5) II, III. Judson, Winterling

Lecture—2 hours; laboratory—9 hours. Prerequisite: students in the Family Nurse Practitioner Program. Instruction and practice in advanced interviewing technique; in physician diagnosis including advanced skills used in characterizing abnormal findings; pathophysiology of organ systems. (S/U grading only.)

420C-420D. Advanced Clinical Medicine for Family Nurse Practitioners (5-5) IV, I, Winterling, Mentink

Lecture—2 hours; laboratory—9 hours. Prerequisite: courses 420A-420B. Instruction and clinical practice in the diagnosis and treatment of common episodic medical problems and management of chronic disease; advanced pharmacy principles; clinical laboratory medicine and radiology. (S/U grading only.)

421A. Graduate Seminar in Preventive Medicine for Family Nurse Practitioners (2) II. Schwartz

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Selected topics related to disease prevention and health maintenance. (H/S/U grading only for medical students.)

421B-421C. Graduate Seminar in Psychosocial and Cultural Aspects of Disease for Family Nurse Practitioners (2-2) III, IV. Fenley, Judson

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. (H/S/U grading only for medical students.)

*421D. Graduate Seminar in Clinical Medicine for Family Nurse Practitioners (2) I, Mentink, Dostal

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 Family Nurse Practitioners (4) I, Brown, Chaykin

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: course 410. 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. Chaykin, Andrus

Discussion—1 hour; laboratory—8 hours. Prerequisite: courses 410, 420A-420B, 420C-420D, 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. (H/S/U grading only for medical students.)

Human Anatomy

Upper Division Courses

101. The Gross and Microscopic Structure of the Human Body (5) II. The Staff (Enders in charge)

Lecture—4 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1 or 10; Physiology 2, 2L, or Zoology 2 recommended. A study of the gross and microscopic structure of the human body with emphasis on function. The laboratory will be taught from dissections, models, and slides to give students the opportunity to learn structure from direct experience. Limited enrollment.

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Enders 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 (Enders in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201. Human Neuroanatomy (6) II. Brownson, Vijayan
Lecture—5 hours; laboratory—3 hours. Prerequisites: 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.

*205A. Biochemical and Morphological Aspects of Mammalian Reproduction (2) II. The Staff

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Critical reading and discussion. Structural and molecular aspects of spermatogenesis; sperm maturation and transport; capacitation; and fertilization. Emphasis on the male reproductive system. Limited enrollment. Offered in even-numbered years. (S/U grading only.)

205B. Biochemical and Morphological Aspects of Mammalian Reproduction (2) II. The Staff

Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructor. Critical reading and discussion. Structural and molecular aspects of oogenesis; ovulation; egg transport; fertilization; and implantation. Emphasis on the female reproductive system. Limited enrollment. Offered in odd-numbered years. (S/U grading only.)

***211. Prenatal Development of Human Nervous System** (5) I, II, III, IV Gardner, 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, here possible, correlation with development of function and behavior.

212. Advanced Course in Human Prenatal Development (5) I, II, III, IV. O'Rahilly, Gardner

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.)

***280. Human Surgical Anatomy** (4) III. The Staff

Discussion—2 hours; laboratory—4 hours. Prerequisite: human gross anatomy or completion of second-year medical curriculum, and consent of instructor; open to graduate students. Regional and radiological anatomy as applied to the clinical sciences. Offered in odd-numbered years.

290. Seminar (1) I, III. The Staff (Enders in charge)

Seminar—1 hour. Prerequisite: consent of instructor (S/U grading only for graduate students. H/S/U grading only for medical students.)

298. Advanced Group Study (1-5) I, II, III, IV. The Staff (Enders in charge)

Prerequisite: consent of instructor; open to graduate students.

299. Research (2-12) I, II, III, IV. The Staff (Enders in charge)

Laboratory—6-36 hours. Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses***401. Functional Neuroanatomy** (3) II. Brownson and staff

Lecture—2 hours; laboratory—2 hours. Prerequisite: consent of instructor. The microscopic anatomy of the nervous system. Emphasis on spinal and cranial pathways to and from cortical and subcortical levels while stressing human neuroanatomy and basic neurology. (H/S/U grading only for medical students.)

405. Human Gross Anatomy (6) II. Erickson

Lecture—2 hours; discussion—1 hour; laboratory—9 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. (H/S/U grading only for medical students.)

***406. Brain Reconstruction** (4) III. Brownson

Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: consent of instructor; open to graduate students. Building a human brain model in three dimension using wire, wood, plastics and precut forms as the basis for teaching clinical neuroanatomy and neurophysiology to all qualified students. Also includes human wet specimens and slides. Limited enrollment. (H/S/U grading only for medical students.)

410. Human Embryology (3) III. Barry

Lecture—2 hours; discussion—1 hour. Prerequisite: completion of first-year medical studies or consent of instructor. Lectures and seminar discussions on normal and abnormal human development with an emphasis on congenital anomalies. (S/U grading only. H/S/U grading only for medical students.)

Human Physiology**Upper Division Courses****151. Information Systems: Design and Analysis of Computerized Information Systems** (3) I. Walters

Lecture—2 hours; laboratory—3 hours. Prerequisite: programming desirable; consent of instructor. Basic storage

devices; organization of information; design of information systems, on-line, off-line and multilevel; relation of systems design to retrieval requirements and storage elements. Laboratory in preparation of modest information system.

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. Renkin and staff

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.

221. Surgical Approaches to Physiology (2) I, II, III, IV. Smith and staff

Discussion—1 hour; laboratory—3 hours. Prerequisite: Physiology 210A-210B or Medical Sciences 411A-411B and consent of instructor; open to graduate students. A practical laboratory experience in the classical surgical techniques used to obtain physiological information.

231. Renal Physiology (3) I. Rabinowitz

Lecture—3 hours. Prerequisite: Physiology 110A, 110B or the equivalent; graduate standing and consent of instructor. 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 reports.

252. Advanced Information Systems (3) II. Walters

Lecture—1 hour; seminar—2 hours. Prerequisite: course 151 and consent of instructor. Case studies of information systems; development of system components through projects; analysis of on-line file structures; strategies for systems performance optimization. (Same course as Biomedical Engineering 252.)

***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; open to graduate students. 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; open to graduate students. Clinical laboratory, physiological evaluations of pulmonary function.

282. Comparative Pulmonary Physiology (3) I, II, III. Cross

Laboratory—8 hours. Prerequisite: Medical Sciences 411B; open to graduate students. Comparative studies of pulmonary function.

283. Respiratory Physiology (3) III. Green and staff

Lecture—3 hours. Prerequisite: Physiology 210A-210B or the equivalent, and consent of instructor; open to graduate students. 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 210A-210B 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: Physiology 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, open to graduate students. (S/U grading only.)

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**270. Cardiovascular Research Conference** (2) I, II, III, IV. The Staff (Mason in charge)

Lecture—1 hour; discussion—1 hour. Prerequisite: freshman medical year or mammalian physiology. Weekly conference led by staff on specific topics in cardiovascular research and cardiovascular disease mechanisms. (S/U grading for graduate students; H/S/U grading only for medical students.)

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.

NOTE: For key to footnote symbols, see page 132.

Medicine

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 (3-12) I, II, III, IV. The Staff (Kumagai in charge)
Prerequisite: consent of instructor. Endocrinology research. (S/U grading only.)

Internal Medicine—Hematology-Oncology

Graduate Courses

298. Topics in Hematology (1-4) I, II, III, IV The Staff (Lewis in charge)
Prerequisite: one year of graduate work and 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. (H/S/U grading only for medical students.)

299. Research (1-12) I, II, III, IV. The Staff (Lewis in charge)
Prerequisite: consent of instructor. Laboratory investigation contributing to the dissertations for a graduate degree. (S/U grading only.)

Professional Courses

400. Blood and Marrow Morphology in Disease (1-2) I, II, III, IV O'Grady
Discussion—1-2 hours; laboratory—1-4 hours. Prerequisite: one year of human or veterinary medicine and consent of instructor; open to graduate students. Study of the morphologic changes in hematologic disease presented through case description and including review of pathophysiology and appropriate therapeutics. Limited enrollment. (H/S/U grading only for medical students.)

402. Topics in Medical Immunology (1) I, II, III, IV MacKenzie
Discussion—1 hour; library work. Prerequisite: one year of postbaccalaureate work and consent of instructor. Outside reading and discussion of current advances in medical immunology with emphasis on application of laboratory studies to clinical disease. (H/S/U grading only for medical students.)

Internal Medicine—Infectious Diseases

Upper Division Course

199. Infectious Diseases Research (1-5) I, II, III, IV. The Staff (Hoeplich 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 presentations. (P/NP grading only.)

Graduate Courses

292. Topics in Medical Microbiology, Infectious Diseases and Immunology (1) I, II, III, IV Hoeplich
Seminar—1 hour. Prerequisite: consent of instructor. Assigned reading and discussion on recent advances in medical microbiology, infectious diseases and immunology. (S/U grading only.)

293. Topics in Diagnostic Microbiology and Infectious Diseases (1) I, II, III. Barry and staff
Seminar—1 hour. Prerequisite: consent of instructor. Laboratory demonstrations, lectures and discussions with assigned readings: review of laboratory practices currently used for establishing the etiologic diagnosis of infectious diseases. Limited enrollment. (S/U grading only.)

Professional Courses

498. Pulmonary Bacterial Infections (2) I, II, III, IV Goldstein
Seminar—1 hour; laboratory—4 hours. Prerequisite: consent of instructor. Weekly seminar and research project in the field of pulmonary infection. Seminars and research projects concerned with bacterial virulence; host mechanisms of bacterial resistance and the role of exogenous agents in interfering with the "normal" host-parasite interrelationships. Limited enrollment. (H/S/U grading only for medical students.)

499. Research Topics in Infectious Disease (2-12) I, II, III, IV Hoeplich, Goldstein, Barry
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. (H/S/U grading only for medical students.)

Internal Medicine—Nutrition

Graduate Course

210. Nutritional Aspects of Medical Practice (3) III. The Staff (Hodges in charge)
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 therapy. Faculty lectures and student seminars will be coordinated. (H/S/U grading only for medical students.)

Internal Medicine—Rheumatology

Graduate Courses

290. Pathogenetic Mechanisms in Development of Immunologic Disease (2) II. Gershwin
Seminar—2 hours. Prerequisite: consent of instructor. The recognition of the sanctity of "self" will be presented as preliminary discussion of: (1) theories of autoimmunity; (2) mechanisms of tissue inflammation; (3) human diseases mediated by or associated with immunological abnormalities and; (4) immunotherapeutic possibilities in treatment of dysimmune pathology. (H/S/U grading only for medical students.)

291. Seminars in Virology, Immunology and Immunotherapy of Malignant Disease (2) I. Gershwin
Seminar—2 hours. Prerequisite: consent of instructor. The relationship of immunocompetence to oncogenesis and to the clinical course of a tumor-bearing host will be considered. A heavy emphasis will be placed on congenital immune deficiency states and the role of virus as both initiator and adjuvant to neoplasm induction. (H/S/U grading only for medical students.)

292. Clinical Pharmacology of Immunosuppressive and Cytotoxic Drugs (2) III. Gershwin
Seminar—2 hours. Prerequisite: consent of instructor. The biochemistry, metabolism and mechanism of action of drugs currently used in chemotherapy of malignant disease and treatment of the so-called autoimmune diseases will be studied. The role of these agents as both immunosuppressive and cytotoxic agents will be heavily explored. (H/S/U grading only for medical students.)

293. Genetic Control of the Immune Response (2) III Gershwin
Lecture—2 hours. Prerequisite: previous immunology course and consent of instructor. The genetic regulation of

immune responsiveness will be presented with particular emphasis on (1) histocompatibility antigens; (2) immune response genes; (3) high/low responders; and (4) susceptibility to autoimmune and malignant disease. (S/U grading only for graduate students; H/S/U grading only for medical students.)

298. Topics in Rheumatology and Clinical Immunology (1-4) I, II, III, IV. Gershwin

Laboratory—1-4 hours. Prerequisite: consent of instructor. Library and/or lab work as required. (H/S/U grading only for medical students; S/U grading only for graduate students.)

299. Research in Autoimmune Disease (1-18) I, II, III, IV. Gershwin

Laboratory—1-18 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, Sjögren's syndrome, polymyositis and drug hypersensitivity. (H/S/U grading only for medical students; S/U grading only for graduate students.)

Medical Learning Resources

Upper Division Courses

155. Applications of Computers to Biomedicine (2) I, III. Walters
Lecture—1 hour; computer demonstrations or lecture—1 hour. Prerequisite: consent of instructor. Survey of computer applications in patient monitoring, simulation of biological systems, data acquisition and reduction systems, interpretation of electrocardiograms, and the use of analytical programs for research purposes.

160. Instructional Media in Biomedical Education (2) II. West, Walters

Lecture—1 hour; laboratory—3 hours. Prerequisite: Medical Sciences 410, 411A or the equivalent; consent of instructor. Didactic and practical experience in the variety, operation and uses of instructional aids in the presentation of instruction in biology and medicine.

Graduate Courses

220. Evaluation in the Medical Curriculum (2) III. West, Walters
Lecture—1 hour; discussion—1 hour. Prerequisite: Medical Sciences 410, 411A or the equivalent; consent of instructor; open to graduate students. Development of educational goals and objectives; criteria for measurement of results as related to stated objectives; evaluation of instructional methodology; evaluation of learning achieved; comparative evaluation of alternate instructional pathways.

262. Computers in Instruction (2) III. Walters
Lecture—1 hour; laboratory—3 hours. Open to graduate students. Survey of techniques and languages for computer support of instruction. Includes computer-assisted and computer-managed instruction, simulation, and use of data bases. Projects in implementing specific learning blocks.

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.)

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
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 (2) III, IV. Theis
Discussion—2 hours. Prerequisite: graduate student with consent of instructor. Clinical epidemiological laboratory study of protozoa, helminths and arthropods of medical importance.

215L. Medical Parasitology Laboratory (1-2) III, IV. Theis
Laboratory—3-6 hours. Prerequisite: graduate student with consent of instructor. Laboratory aspects to accompany course 215.

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 Science 410 and consent of instructor; open to graduate students. This course deals with the clinical epidemiological, and experimental aspects of viral diseases of man. (H/S/U grading only for medical students.)

405. Clinical Immunology (2) III. 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. (H/S/U grading only for medical students.)

407. Chemical and Cellular Immunology (4) III Benjamini, Scienski
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.)

415. Medical Parasitology (1-12) III, IV. Theis
Discussion—1-6 hours; laboratory—0-12 hours. Prerequisite: medical or graduate students with consent of instructor. Clinical, epidemiological, laboratory study of protozoa, helminths, and arthropods of medical importance. (H/S/U grading only for medical students.)

Neurology

Graduate Course

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.)

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; H/S/U grading only for medical 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: for medical and veterinary students, interns and residents; consent of instructor. Current specimens are sectioned and discussed. Given jointly with Departments of Neurology and Pathology. (H/S/U grading only for medical students; same course as Pathology 405, Medicine.)

Orthopaedic Surgery

Professional Course

499. Orthopaedic Research (1-12) I, II, III, IV. Riggins and staff
Prerequisite: undergraduate, graduate, and medical students with consent of instructor; open to graduate students. Principles of management of lacerations and the various techniques of suturing a wound. (H/S/U grading only for medical students.)

Otorhinolaryngology

Professional Courses

400. Suture Techniques (1) I, II, III, IV. Bernstein and staff
Lecture—5 hours total; laboratory—10 hours total. Prerequisite: second- and fourth-year medical students with consent of instructor, open to graduate students. Principles of management of lacerations and the various techniques of suturing a wound. (H/S/U grading only for medical students.)

401. Clinical Examinations in Otorhinolaryngology (1) I, II, III, IV. Bernstein and staff
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. (H/S/U grading only for medical students.)

402. Otorhinolaryngology in Family Practice (1) I, II, III, IV. Bernstein and staff
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. (H/S/U grading only for medical students.)

460. Clinical Otorhinolaryngology Elective (3-18) I, II, III, IV. Bernstein and staff
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. (H/S/U grading only for medical students.)

490. Journal Seminar (1) I, II, III, IV. Bernstein and staff
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. (H/S/U grading only for medical students.)

491. Otorhinolaryngologic Seminars (1) I, II, III, IV. Bernstein and staff
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. (H/S/U grading only for medical students.)

499. Research (1-12) I, II, III, IV. Bernstein and staff
Prerequisite: medical students with consent of instructor, open to graduate students. Participation in ongoing projects. (H/S/U grading only for medical students.)

Pathology

Graduate Courses

207. Introduction to Nervous System Pathology (1-4) I, II, III, IV. 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. (H/S/U grading only for medical students.)

210. Introduction to Human Pathology (5) I, Stowell and staff
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; open to graduate students. Group study in a variety of advanced topics in general and special pathology.

299. Research (1-12) I, II, III, IV. The Staff (Wellings in charge)
Prerequisite: consent of instructor; open to undergraduate and graduate students. 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. Faulkin Wellings, Cardiff
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. (H/S/U grading only for medical students.)

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. (H/S/U grading only for medical students.)

404. Forensic Pathology (2) I, Rooney and 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

Medicine

to histopathologic diagnosis and toxicology. Limited enrollment. (H/S/U grading only for medical students)

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) (H/S/U grading only for medical students)

406. Histopathologic Diagnosis (1) I, II, III. Toreson and staff
Seminar—1 hour. Prerequisite medical students or consent of instructor; open to graduate students Intensive and detailed histopathologic diagnosis Material covered varies. Limited enrollment (H/S/U grading only for medical students.)

407. Diseases of the Nervous System (1-4) I, II, III, IV. 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 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. (H/S/U grading only for medical students.)

408. Autopsy Case Studies (1-12) I, II, III, IV. Ruebner and staff
Discussion—1-4 hours; laboratory—3-24 hours. Prerequisite medical and veterinary students with consent of instructor; open to graduate students. Participation and performance under supervision of complete autopsies with correlative studies of clinical material, gross, microscopic, and laboratory findings (H/S/U grading only or medical students.)

409. Neuropathology Conference (1) I, II, III, IV. Ellis
Seminar—1 hour Prerequisite medical students or consent of instructor, open 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 (H/S/U grading only for medical students.)

490. Seminar in Pathology (2) I, II, III. Cardiff, Ruebner
Seminar—2 hours. Prerequisite consent of instructor; open 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 (H/S/U grading only for medical students)

491. Surgical Pathology Seminar (1) I, II, III, IV. Toreson and staff
Seminar—1 hour Prerequisite medical students or consent of instructor; open to graduate students Gross and microscopic pathology of current surgical specimens and study sets with clinicopathological correlation. Limited enrollment. (H/S/U grading only for medical students.)

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. (H/S/U grading only for medical students.)

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 (1-5) I, II, III, IV. The Staff (Gold in charge)
Laboratory—1-5 hours 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

Upper Division Courses

100. Pharmacology for Educators (2) I, III. Stark, 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 topics

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. This course is specifically oriented to the undergraduate

102. Pharmacodynamics A. (2) I. Hance, West
Lecture—1 hour; discussion—1 hour Prerequisite Medical Science 410 and 411B or the equivalent. Pharmacology of the autonomic system; pharmacology of the cardiovascular system; renal pharmacology and pharmacology of nerve and neuromuscular junction

103. Pharmacodynamics B. (2) II. K. F. Killam, E. K. Killam
Lecture—1 hour; discussion—1 hour. Prerequisite Medical Science 410, 411B, and 413A-413B-413C, or the equivalent Pharmacology of general anesthetics, hypnotics, sedatives, analgesics and antipyretics; narcotic analgesics; convulsants and stimulants, anticonvulsants and drug altering behavior

104. Pharmacology Laboratory A: Pharmacodynamics (2) I. Hollinger, West
Discussion—1 hour; laboratory—4 hours. Prerequisite: courses 102 and 103 or the equivalent. Laboratory techniques used to evaluate the action of drugs. Offered in even-numbered years.

105. Pharmacology Laboratory B: Neuropharmacology (2) II. Hance, E. K. Killam
Discussion—1 hour; laboratory—4 hours Prerequisite: Medical Science 410, 411B, and 413A-413B-413C, or the equivalent. Specialized laboratory techniques used to evaluate centrally acting drugs. Offered in odd-numbered years

106. Pharmacology Laboratory C: Psychopharmacology (2) III. K. F. Killam, Stark
Discussion—1 hour; laboratory—4 hours. Prerequisite: Medical Science 410, 411B and 413A-413B-413C, or the equivalent Specialized laboratory techniques used to evaluate drugs altering behavior Offered in odd-numbered years.

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 (1-3) 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. K. F. Killam and staff
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. (H/S/U grading only for medical students.)

200AL-200BL. Advanced General Pharmacology. (1-1) I, II. K. F. Killam and staff
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. (H/S/U grading only for medical students.)

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; open to graduate students. 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; open to graduate students. 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; open to graduate students. 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; open to graduate students. Activity of drugs altering mood and behavior: psychopharmacologic agents, hallucinogens, antidepressants. Offered in odd-numbered years.

205. Drug Distribution and Metabolism (1-3) III. Stark
Lecture—1 hour; discussion—1 hour. Prerequisite: course 101 or Medical Science 410 and 411B, or the equivalent; open to graduate students. Evaluation of problems of drug distribution and metabolism with special reference to autoradiographic techniques. Offered in even-numbered years.

207. Drug Alteration of Subcellular Function (1-3) II. Hollinger
Lecture—1 hour; discussion—1 hour; Seminar—1 hour. Prerequisite: course 101 or Medical Science 410 or the equivalent; open to graduate students. The interaction of drugs and subcellular components with special emphasis on mechanism of action. Offered in odd-numbered year.

208. Application of Computers to Pharmacology A. (1) I, Hance; II, K. F. Killam; III, Stark
Lecture—1 hour. Prerequisite: consent of instructor; open to graduate students. Presentation of basic concepts and problems.

220. Statistical Approach to Pharmacological Research (2) III. Hance
Lecture—2 hours. Prerequisite: course 200A or consent of instructor. Introduction to application of statistics in pharmacological research and therapeutics, basic concepts of distributions, measures of location, dispersion and correlation, significance, probability, uncertainty, design of experiments.

271. Clinical Pharmacology (2-10) I, II, III, IV. Winters, Renolett
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; open to graduate students. 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; open to graduate students. (S/U grading only.)

Physical Medicine and Rehabilitation

Upper Division Courses

198. Directed Group Study (1-5) I, II, III, IV. Sterling and staff
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 (Sterling in charge)
Prerequisite: advanced standing and consent of instructor. Supervise independent study of project and research for upper division students or graduate students. (P/NP grading only.)

Graduate Course

298. Selected Topics in Rehabilitation and Physical Medicine (1-5) I, II, III, IV. Waring and staff
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.

Professional Courses

470. Rehabilitation Medicine for Allied Health Sciences (2) I, II, III, IV. Zelle
Lecture—1 hour; laboratory—3 hours. Prerequisite: allied health science students; open to graduate students. Designed to acquaint students in the clinical application of the physical modalities and the principles of medical and vocational rehabilitation including the physical, psychosocial and occupational aspects.

499. Research in Physical Medicine (2) IV, I, II, III. Waring
Seminar—1 hour; laboratory—7 hours. Prerequisite: completion of fourth-year in medicine; open to graduate students. Individual research under the direction of a staff member. (H/S/U grading only for medical students.)

Psychiatry

Upper Division Courses

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Langsley 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 (Langsley 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

220. 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. (H/S/U grading only for medical students.)

222. 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, sociologic studies of the mental hospital. (H/S/U grading only for medical students.)

223. Death and Dying (2) II, Rockwell; III. Bennington
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.)

224. The Dying Patient: Study of Dynamics and Management of Dying Process (3) III. Tupin, Schuller
Seminar—3 hours. Prerequisite: consent of instructor. Help the student (a) deal with his feelings about death, (b) become familiar with the dying process, (c) develop skills in working with patients and families, and (d) in management of grief; acquaint student with literature; discussion of ethical and moral issues.

225. Biological and Cultural Basis of Human Behavior (2) II. Jensen, Crain
Seminar—2 hours. Prerequisite: consent of instructor. Discuss 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.)

226. Psychiatric Implications of Legal Intervention (2) I, II, III. Tupin, Bauer
Discussion—2 hours. Prerequisite: consent of instructor. The influence of laws on human behavior, and vice versa, will be explored. Particular emphasis on youth and juvenile court procedures. Moot court demonstrations. (S/U grading only.) (Same course as Community Health 226.)

298. Directed Group Study For Graduate Students (1-5) I, II, III, IV. The Staff (Langsley 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, IIII. The Staff (Langsley 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. Langsley
Lecture—1 hour; discussion—2 hours. Prerequisite: medical students or consent of instructor; open to professional school students with consent of instructor. Principles and techniques of family and marital counseling as conducted by the practicing physician. Cases will be presented as well as videotaped clinical examples of marriage counseling. (H/S/U grading only for medical students.)

403. Medical Aspects of Human Sexuality (2) II, III. Jensen and staff
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. (H/S/U grading only for medical students.)

404. Readings in the Psychological Aspects of Medicine (2) I, II, III, IV. Schuller
Lecture—½ hour; seminar—1½ hours. Prerequisite: medical students. Assigned readings from the psychosomatic literature, to be prepared for presentation by the student, with discussion by other class participants. (H/S/U grading only.)

420. Grand Rounds for Department of Psychiatry (1) I, II, III, IV. Langsley
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. (H/S/U grading only for medical students.)

473. Antisocial Behavior (3-19) I, II, III, IV. Tupin, Schuller
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. (H/S/U grading only for medical students.)

498. Directed Group Study (1-5) I, II, III, IV. The Staff (Langsley in charge)
Hours to be arranged. Prerequisite: consent of instructor; open to graduate students. For students desiring to explore particular topics in depth. Lectures, conferences, and seminars may be involved. (H/S/U grading only for medical students; S/U grading for graduate students.)

499. Research (1-12) I, II, III, IV. The Staff (Langsley in charge)
Hours to be arranged. Individual research on selected topics or research projects. (H/S/U grading only for medical students; S/U grading only for graduate students.)

Radiology—Diagnostic

Professional Courses

498. Group Study in Diagnostic Radiology (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (H/S/U grading only for medical students.)

499. Research in Diagnostic Radiology (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (H/S/U grading only for medical students.)

NOTE: For key to footnote symbols, see page 132.

Medicine (Veterinary Medicine)

Radiology—Nuclear Medicine

Upper Division Courses

101. Biomedical Radiochemistry (3) III. S. J. DeNardo, Krohn, Chen

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.)

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 (H/S/U grading only for medical students.)

400B. Fundamental Nuclear Medicine (4) II. DeNardo,

Berman, Stadalnik, 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. (H/S/U grading only for medical students.)

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 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. (H/S/U grading only for medical students.) (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 (H/S/U grading only for medical students.)

499. Research in Nuclear Medicine (1-12) I, II, III, IV. The

Staff (Raventos in charge)

Prerequisite: consent of instructor (H/S/U grading only for medical students.)

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 Radia-

tion Therapy Center. (H/S/U grading only for medical students; S/U grading only for graduate students.)

Radiology—Therapeutic

Professional Courses

498. Group Study in Therapeutic Radiology (1-12) I, II,

III, IV. The Staff

Prerequisite: consent of instructor (H/S/U grading only for medical students.)

499. Research in Therapeutic Radiology (1-12) I, II, III,

IV. The Staff

Prerequisite: consent of instructor. (H/S/U grading only for medical students.)

Medicine

(School of Veterinary Medicine)

Murray E. Fowler, D.V.M., Chairperson of the Department

Department Office, 1321A Haring Hall

Faculty

Alexander A. Ardans, D.V.M., Associate Professor

Dale L. Brooks, D.V.M., Lecturer

Gary P. Carlson, D.V.M., Ph.D., Assistant

Professor

John F. Christensen, D.V.M., Ph.D., Professor

Emeritus

Laurence R. Enos, Pharm.D., Lecturer

Stephen J. Ettinger, D.V.M., Associate Clinical

Professor

Murray E. Fowler, D.V.M., Professor

John S. Glenn, D.V.M., Ph.D., Assistant Professor

Roy V. Henrickson, D.V.M., Lecturer

Charles A. Hjerpe, D.V.M., Associate Professor

E. B. Hudson, D.V.M., Lecturer

Humphrey D. Knight, D.V.M., Ph.D., Associate

Professor

Gerald V. Ling, D.V.M., Associate Professor

Donald G. Low, D.V.M., Ph.D., Professor

Blaine McGowan, Jr., D.V.M., Professor

Ronald L. Mull, D.V.M., Ph.D., Lecturer

Neils C. Pedersen, D.V.M., Ph.D., Assistant

Professor

William R. Pritchard, D.V.M., Ph.D., J.D., Professor

Livio G. Raggi, D.V.M., Ph.D., Professor

Sigmund T. Rich, D.V.M., Lecturer

Edward A. Rhode, D.V.M., Professor

Bradford P. Smith, D.V.M., Assistant Professor

Anthony A. Stannard, D.V.M., Ph.D., Associate

Professor

Donald R. Strombeck, D.V.M., Ph.D., Associate

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

270. Jurisprudence and Law for the Veterinarian (1) II.

Pritchard

Lecture—1 hour. Prerequisite: senior standing in School of

Veterinary Medicine or consent of instructor. Introduction to principles of veterinary medical jurisprudence and legal concepts pertinent to professional activities. (S/U grading only for veterinary students.)

280. Advanced Pulmonary Physiology (3) II. Gillespie,

Cross

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.

280L. Advanced Pulmonary Physiology (1) II. Gillespie,

Cross

Laboratory—4 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. Laboratory exercises illustrate modern functional concepts and procedures.

285. Clinical Applications of Body Acid-Base Physiology (2) III. Gillespie. Cross

Lecture—2 hours. Prerequisite: graduate student status or consent of instructor. Examination of the buffer systems in the mammalian body. Effects on the buffer systems and organ functions of adding endogenous or exogenous acid or basic products to the body fluids. Control mechanisms and body fluid relationships to the buffer systems.

***290. Seminar in Veterinary Medicine** (1) I, II, III. The

Staff (Fowler in charge)

298. Group Study (1-2) 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 (1-9) 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, 4208 Storer Hall

Committee in Charge

Wolfgang W. Moelleken, Ph.D. (*German*);
 Committee Chairperson
 Neal W. Gilbert, Ph.D. (*Philosophy*)
 Robert J. Grigg, Ph.D. (*Art*)
 Gerald Herman, Ph.D. (*French*)
 James J. Murphy, Ph.D. (*Rhetoric*)
 Daniel Silvia, Ph.D. (*English*)
 Alan A. Stambusky, Ph.D. (*Dramatic Art*)

NOTE: For key to footnote symbols, see page 132.

The Major Program

The major in Medieval Studies is designed to introduce the student 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	
Recommend: Art 1B, History 4A, Philosophy 21, Medieval Studies 20A, 20B, 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	52
History, at least 12 units from History 102B, 121A, 121B, 121C, 201B	12
Literature: at least 16 units, including two courses from each of two of the following	16
(a) English 111, 112, 113, 150A, 188, 189, 205, 206, 207, 215, 240A, 240B, 240C.	
(b) French 115A, 115B, 202A, 202B, 202C, 202D, 203, 204A, 204B, 204C, 204D.	
(c) German 120, 121, 122, 249, 250, 285.	
(d) Italian 113A, 113B, 115A, 115B, 139A, 139B; Spanish 225.	
(e) Russian 200, 220.	
(f) 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, 290; Religious Studies 102, 110	8
Arts and language, at least 8 units from Art 176A, 176B, 176C, 177A, 178A, 178B, 276, 278; Dramatic Art 156, 230A, 230B; French 201A; German 106, 200, 201, 202, 203, 205; Music 114, 199; Rhetoric 110, 111, Russian 202	8
Political thought, at least one course from Political Science 115, 116, 118A, 213	4
Senior thesis, Medieval Studies 190	4
Total Units for the Major	52

Prerequisites

See page 130 regarding preparation for graduate courses. Art 1B should be taken prior to enrolling in Art 27B, and Music 4 and 21A or consent of instructor are required prior to enrolling in Music 114.

Major Advisers. W. M. Bowsky, S. A. Fehm, G. Herman, J. J. Murphy.

COURSES IN MEDIEVAL STUDIES

Lower Division Courses

20A. Readings in Early Medieval Culture (4) II. Murphy and 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. Readings in the Culture of the High Middle Ages (4) III. Murphy and 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.

Upper Division Courses

190. Senior Thesis (4) I, II, III. Murphy and 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. Moelleken
 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 (Moelleken in charge)
 (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Moelleken in charge)
 (P/NP grading only.)

Mexican-American (Chicano) Studies

(College of Letters and Science)

Guillermo Rojas, Ph.D., Acting Program Director
 Program Office, 211 North Hall

Committee in Charge

Francisco J. Samaniego, Ph.D. (*Mathematics*),
 Committee Chairperson
 Douglas L. Minnis, Ed.D. (*Education*)
 Manuel J. Neri (*Art*)
 Adaljiza S. Riddell, Ph.D. (*Political Science*)
 Refugio I. Rochin, Ph.D. (*Agricultural Economics*)
 Robert M. Scari, Ph.D. (*Spanish*)

The Major Program

This interdepartmental major consists of courses in the Spanish language, linguistics, Mexican and Mexican-American history, culture and literature, and social sciences. The course of study allows for flexibility to accommodate students pursuing interests in bilingual education, community or social service, or advanced professional preparation.

Mexican-American (Chicano) Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	9-30
Spanish 1 or 1ATA, 2 or 2ATA, 3, 6; (or the equivalent)	0-21
Spanish 25, 26, 27B	9
Depth Subject Matter	39-40
Spanish 101A, 101B, 101C (for non-native speakers of Spanish); or Spanish 102A, 102B, 102C (for native speakers)	12

Microbiology; Military Science

One course from Spanish 131, 132, 133	3-4
Spanish 129 or 135	4
Linguistics 150 or Education 151	4
History 169A, 169B; 166A or 166B	12
Political Science 168	4
Total Units for the Major	48-70

Recommended

Linguistics 35; American Studies 45; two courses from Spanish 30A, 30B, 30C (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, 300.

Further Study. A student contemplating studies in graduate or professional schools can, with the aid of an adviser, build a program around the discipline of his or her choice, i.e., Spanish or Spanish-American literature, history, or political science. Students contemplating careers in bilingual education should consult the Department of Education for information about the Teacher Credential Program (see also page 107)

Major Adviser. See *Class Schedule and Room Directory* or Committee members.

COURSE IN CHICANO STUDIES

Lower Division Course

10. Introduction to Chicano Studies (4) III. The Staff
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.

Microbiology

See Also Medical or Veterinary Microbiology

Microbiology (A Graduate Group)

David Pratt, Ph.D., Chairperson of the Group
Group Office, 156 Hutchison Hall

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 101.

Graduate Advisers. E. Benjamini (Medical Microbiology), R. E. Kunkee (Viticulture and Enology), S. G. Kustu (Bacteriology), R. Yamamoto (Epidemiology and Preventive Medicine).

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)

Richard G. Adamski, Lieutenant Colonel,
Chairperson of the Department
Department Office, 125 Gymnasium

Faculty

Richard G. Adamski, Lieutenant Colonel,
Professor
Harold D. Brown, Captain, Assistant Professor
Michael D. Howe, Major, Associate Professor
Carl W. Lagle, Captain, Assistant Professor
Robert J. Pope, Major, Associate Professor
Homer J. Raycraft, 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, qualifies a student for a commission in the Army Reserve. The objective of the ROTC program is to educate young men and women to become officers who are capable of further development through active duty training and service in the Reserves. The program assists qualified students in all academic fields to prepare for positions of leadership in a military or civilian career. 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 upper division ROTC will not exceed three years.

Department Programs

Students are enrolled in military science under one of two programs.

Four-Year Program. Students are enrolled in lower division for the first two years on a voluntary basis. No military obligation is accrued during completion of the lower division courses. Admission to the upper division is by application from those second-year lower division students who meet the academic, physical, and military aptitude requirements.

Upper division students receive \$100 subsistence per month after executing a contract agreeing to complete the course and accept a commission if offered. The commission must be obtained prior to the student's 28th birthday. During the course all military science textbooks, uniforms and equipment are provided without cost to the student. Students are trained at summer camp between their third and fourth years of the course. Camp training stresses the evaluation and practical application of tactical, technical and administrative procedures with particular emphasis on individual

participation, leadership development and the capability to function effectively in positions of significant responsibility. Each cadet is paid half of Second Lieutenant's pay during the period of the camp, plus travel expenses.

Breadth Requirements for Commissioning. In addition to the first and second year, students must complete 9 units of course work in the Humanities which will provide them the opportunity to think creatively and to write and speak effectively. In cases where such course work has been waived by their college, the Chairperson of Military Science may accept such waivers as a fulfillment of this requirement.

Third- and fourth-year students are required to complete 9 units in the Humanities, Natural Sciences, or Social Sciences outside of their major academic discipline.

The breadth requirements as established by each of the colleges normally satisfies the above requirements for Commissioning. In the case of a student who is pursuing a highly specialized discipline with restricted opportunity to take electives, waivers may be granted.

Two-Year Program. This program is primarily designed for the student who has not had the opportunity to pursue lower division ROTC. Applications are accepted during the winter term of the year preceding enrollment in the two-year program. In lieu of lower division courses the applicant must successfully complete a six-week summer camp conducted during the summer preceding enrollment in the upper division program. All other provisions explained above regarding upper division apply to the two-year program.

Flight Training Program. Flight Instruction is offered to students in the second year of the Advanced Course. Under this program the Army will pay for flight training for selected qualified ROTC students. To qualify, the student must have an aptitude for flying and meet required physical standards.

Scholarship Program. Four-year scholarship students are selected in nationwide competition. Successful candidates receive all tuition fees, books, uniforms and \$100 subsistence per month. One-, two- and three-year scholarships with similar benefits are awarded by the Department of the Army to outstanding students enrolled in the ROTC program.

Leadership Laboratory. Students enrolled in ROTC for the purpose of pursuing a commission are required to participate in approximately 10 hours of leadership laboratory per quarter in addition to classroom instruction. No academic credit will be given for leadership laboratory. In addition, these students are required to take ½ unit of Physical Education 1 (rifle marksmanship) during any quarter of their freshman or sophomore years, and 1 unit of Physical Education 10 (physical conditioning) during the Spring Quarter preceding attendance at ROTC Advanced Summer Camp.

Academic Credit

College of Letters and Science. The Bachelor of Arts degree requires the completion of 180 units, of which at least 150 units shall be in courses given by teaching departments in the College of Letters and Science. Military Science courses are counted in the 30-unit allowance for electives.

College of Agricultural and Environmental Sciences. The Bachelor of Science degree in agriculture requires the completion of 180 units. All units of upper and lower division military science courses combined may be accredited toward this requirement.

College of Engineering. Up to six units of Military Science may be accredited as free electives toward the requirement of the College of Engineering for the Bachelor of Science degree.

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

2. Introduction to Military Science (1) I, The Staff Lecture—1 hour. Discussion of nature of armed conflict, traditions of the military service, and principles of warfare, with emphasis on examples drawn from both classical and contemporary conflicts.

3. The Modern Army (2) III, The Staff Lecture—2 hours. The growth and development of the U.S. Army. Emphasis on the evolution of personnel, logistics, and operational organization and policies.

4. Principles of Basic Tactics (1) II, The Staff Lecture—1 hour. Principles of basic operations, tactics, and military combat formations, with emphasis on the individual and small unit. Relationship between the small unit and parent organization.

21. Fundamentals of Military Communications Systems (1) III, The Staff Lecture—1 hour. Introduction to the elements of military communications systems and their application to civil and military operations.

23. Military Operations, Maps and Aerial Photos (2) I, The Staff (Chairperson in charge) Lecture—2 hours. Prerequisite: course 4 or consent of instructor. Analysis and application of the principles of offensive and defensive warfare as applied to small tactical units. Interpretation and application of military map systems and aerial photography.

26. Military History (2) I, The Staff Lecture—2 hours. The strategy and tactics of selected military engagements.

Upper Division Courses

131. Principles of Military Instruction (2) III, The Staff Lecture—2 hours. Principles and practice in fundamentals applicable to military instruction, briefings and staff studies, to include those used to planning, presenting and evaluating. Student's presentation exemplifying lecture material.

132. Theory of Leadership (2) I, The Staff Lecture—2 hours. Principles and theory of leadership; individual and group solution of leadership problems common to small groups.

133. Advanced Military Operations (2) II, The Staff 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. The Military Team (2) II, The Staff Lecture—2 hours. Prerequisite: course 133 or consent of instructor. Fundamentals and dynamics of the military team to include command and staff structures, functions and

operations at division and lower levels. Analysis of logistical operations and intelligence collection and collation.

142. Managerial Principles and Theories (2) I, The Staff Lecture—2 hours. Military administrative principles and personnel management theories, including the military occupational structure, and the administration of military justice.

143. Unconventional Warfare (2) III, The Staff Lecture—2 hours. Prerequisite: course 141. Analysis of unconventional warfare, to include an examination of insurgency and counterinsurgency operations in the world arena.

Music

(College of Letters and Science)

Jerome W. Rosen, M.A., Chairperson of the Department
Department Office, 112 Music Building

Faculty

Robert S. Bloch, M.A., Assistant Professor
Sydney R. Charles, Ph.D., Professor
Duyong Chung, M.M., Associate Professor
Duane L. Cunningham, M.A., Lecturer
Andrew D. Frank, M.A., Assistant Professor
D. Kern Holoman, Ph.D., Assistant Professor
*Albert J. McNeil, M.S., Professor
Robert Miller, B.A., Lecturer (Artist in Residence)
Jan L. Pusina, M.A., Lecturer
Jerome W. Rosen, M.A., Professor
Richard G. Swift, M.A., Professor
William E. Valente, M.A., Assistant 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 students who plan to continue with graduate work in music. At the present time, the Department of Music offers a Master of Arts degree with emphasis upon composition or music history, and a Master of the Arts of Teaching degree with emphasis on the teaching of music.

Music

B.A. 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	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 0-3
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. Those showing deficiencies will be required to take Music 405. 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 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. I-II, A. D. Frank, W. E. Valente; III, A. D. Frank, R. S. Bloch.

Teaching Credential Subject Representative. A. J. McNeil. See page 107 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. I, S. R. Charles; II-III, R. G. Swift.

COURSES IN MUSIC

Lower Division Courses

1. Basic Musicianship (3) I, McNeil; II, _____; III, _____
Lecture—3 hours. Fundamentals of music, singing, ear-training and conducting for prospective classroom teachers.

3A-3B. Introduction to Music Theory (4-4) I-II, Rosen
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. For the general student.

4A-4B-4C. Elementary Theory (5-5-5) I-II-III, Bloch, Frank
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, Frank; II-III, Swift
Lecture—4 hours. Prerequisite: course 4C. Intermediate tonal counterpoint and harmony.

21A-21B-21C. History and Literature of Music (4-4-4) I-II-III, Holoman
Lecture—3 hours; listening section—1 hour. Prerequisite: course 4C. The history of music from antiquity to the present.

27A. Introduction to Musical Literature (4) I, Rosen; II, Frank; III, _____
Lecture—3 hours; discussion—1 hour. Lectures, guided listening and readings designed to furnish the student with an understanding of basic music concepts. Intended primarily for non-majors.

NOTE: For key to footnote symbols, see page 132.

Music

27B. Introduction to Musical Literature (4) II, Rosen; III, Charles

Lecture—3 hours; discussion—1 hour. Prerequisite: course 27A or consent of instructor. Survey of the history of musical styles from antiquity to the present. Lectures, guided listening and readings. Intended primarily for non-majors.

***28. Introduction to Afro-American Music** (4) I, McNeil Lecture—3 hours; listening and discussion—1 hour. Historical and stylistic survey of Afro-American music.

30. Applied Study of Music Literature: Intermediate (1) I, II, III. The Staff (Rosen 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 for a total of 3 units. Auditors not accepted.

41. University Symphony (2) I, II, III. Chung 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 orchestra literature. May be repeated for credit (P/NP grading only.)

43. University Concert Band (2) I, II, Valente; III, _____ 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, McNeil; II, III, Chung 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. Holman 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 Rehearsal—3 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. Study, rehearsal, and performance of ensemble music for strings, winds, 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 (Rosen in charge) (P/NP grading only.)

Upper Division Courses

104A-104B-104C. Advanced Theory (4-4-4) I-II, Valente; 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) I-II-III. Pusina 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) I-II. Frank 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.

***111. Choral Conducting** (2) III. McNeil Lecture—2 hours. Prerequisite: course 5C. Study of the principles and techniques of conducting choral ensembles.

112. Instrumental Conducting (2) I, Chung Lecture—2 hours. Prerequisite: course 5C. Principles and techniques of conducting instrumental ensembles.

***113A-113B. Music of Non-Western Civilizations** (2-2) II, Charles; III, McNeil Lecture—2 hours; listening—1 hour. Prerequisite: course 21A. Study of the native music of Asia (113A); study of the native music of Africa and the Western Hemisphere (113B). Course 113A is not prerequisite to 113B.

114. Music of the Middle Ages (4) I, Charles Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the middle ages.

***115. Music of the Renaissance** (4) I, Charles Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the period from 1430-1600.

***116. Music of the Baroque Period** (4) II. Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the period from Monteverdi to Handel and J. S. Bach.

***117. Music of the Classical Period** (4) III. Swift Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the eighteenth century.

118. Music of the Romantic Period (4) II, Charles Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Studies in the music and styles of the nineteenth century.

119. Music of the Twentieth Century (4) III. Swift Lecture—3 hours; discussion—1 hour. Prerequisite: courses 21C. Studies in the music and styles of the twentieth century.

***127A. Musical Literature: The Opera** (3) I, Holman Lecture—3 hours. Prerequisite: course 27B or consent of instructor. Study of selected operas such as Monteverdi's *Orfeo*, Mozart's *Don Giovanni*, Wagner's *Tristan und Isolde*, Verdi's *Otello*, Debussy's *Pelléas et Mélisande*, and Berg's *Wozzeck*. Intended primarily for non-majors.

***127B. Musical Literature: The Symphony** (3) III. Lecture—3 hours. Prerequisite: course 27B or consent of instructor. Study of selected symphonies by composers such as Haydn, Mozart, Beethoven, Schubert, Brahms, and Stravinsky, emphasizing form and style. Intended primarily for non-majors.

130. Applied Study of Music Literature: Advanced (1) I, II, III. The Staff (Rosen 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 up to 3 units. Auditors not accepted.

141. University Symphony (2) I, II, III. Chung 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 orchestra literature. May be repeated for credit. (P/NP grading only.)

143. University Concert Band (2) I, II, Valente; III, _____ 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, McNeil; II, III, Chung 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. Holman 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 Rehearsal—3 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. Study, rehearsal, and performance of ensemble music for strings, winds, piano, harpsichord, and organ. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Rosen in charge) Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Rosen in charge) (P/NP grading only.)

Graduate Courses

200A-200B. Music Research (4-4) I, II. 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. Frank Seminar—3 hours. Technical projects and free composition.

240A-240B-240C. Techniques of Analysis (4-4-4) I, Charles; II, Swift; III, Bloch Seminar—3 hours. Analysis and analytical techniques as applied to music of all historical style periods.

***291A-291B-291C. Seminar: Topics in Music History** (4-4-4) I-II-III. Charles Seminar—3 hours. Studies in selected areas of music history and theory.

299. Individual Study (2-5) I, II, III. The Staff (Rosen 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) III. The Staff (McNeil in charge) 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.

***302. The Teaching of Music** (3) III. The Staff (McNeil in charge) Lecture—3 hours. Prerequisite: consent of instructor. Methods of teaching college level music literature and music theory courses. Observation of undergraduate classes and supervised teaching experiences.

321A-321B. Stringed Instruments (1-1) II-III. Cunningham Discussion—2 hours. Prerequisite: course 4C.

***322. Brass Instruments** (2) I. Discussion—2 hours. Prerequisite: course 4C.

***323A-323B. Woodwind Instruments** (1-1) II-III. 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 and candidates for the standard teaching credential in music. (P/NP grading only.)

Native American Studies

(College of Agricultural and Environmental Sciences)

206 Walker Hall

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

A.B. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses 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</i> courses which explore and develop creative powers (e.g., art, music, design, etc.)	4
<i>Personal and social behavior</i> courses 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</i> courses which build an understanding of the dynamic	

[†]Students may substitute other Native American Studies courses with the approval of the Native American Studies Major Review Committee.

NOTE: For key to footnote symbols, see page 132.

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. G. C. Longfish.

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 60.)

COURSES IN NATIVE AMERICAN STUDIES

Lower Division Courses

1. Introduction to Native American Studies (4) I, II, III. Risling

Lecture—3 hours; discussion—1 hour. Introduction to U.S. Indian tribal-reservation culture; relationships of Native American Studies to other academic disciplines.

20. The Native American Experience (4) II, III. Adams
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. An introduction to American Indian historical and sociocultural 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, Risling
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, Risling
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 (Risling 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, Risling

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) II, Hutchison

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 20 recommended. History and culture of the Native American people, found in South-eastern 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, Risling

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, Risling

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

Nematology

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, Forbes, Hutchison

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: trains, 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 social 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, Hutchison, Longfish

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) I, 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) II, 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) II, 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 (Risling 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, Risling 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, Risling in charge

Prerequisite: major in Native American Studies and consent of advisor. 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 (Risling 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 (Risling 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 (Risling 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 (Risling in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Nematology

(College of Agricultural and Environmental Sciences)

Armand R. Maggenti, Ph.D., Chairperson of the Division

Division Office, 482 Hutchison Hall (752-1403)

Faculty

Winfield H. Hart, Ph.D., Lecturer
Benjamin F. Lownsbery, Ph.D., Professor
Armand R. Maggenti, Ph.D., Lecturer
Dewey J. Raski, Ph.D., Professor
David R. Viglierchio, Ph.D., Lecturer

Major Programs and Graduate Study. See the majors in Environmental Toxicology (page 208) and Plant Science (page 276). For graduate study see page 101.

COURSES IN NEMATOLOGY

Questions pertaining to the following courses should be directed to the Department of Entomology, 367 Briggs Hall (752-0483).

100. General Plant Nematology (4) I, Lownsbery
Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1 or 10. 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. The relationship of nematodes to man's environment. Classification, morphology, ecology, distribution, and importance of nematodes occurring in water and soil as parasites of plants and invertebrate animals.

130. Principles of Nematode Control (4) III, Lear
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100; Chemistry 8B and Mathematics 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) I, Maggenti**
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 (4) II, Maggenti**
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 220. The taxonomy, morphology, and comparative morphology of soil, freshwater, and marine nematodes. Offered in even-numbered years.

290. Seminar (1) II, The Staff (Maggenti in charge)
Seminar—1 hour. (S/U grading only.)

299. Research (1-9) I, II, III, The Staff (Maggenti in charge)
(S/U grading only.)

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
Nancy L. Canolty, Ph.D., Assistant Professor
Andrew J. Clifford, Ph.D., Assistant Professor
Louis E. Grivetti, Ph.D., Assistant Professor
(*Nutrition, Geography*)
Frederic W. Hill, Ph.D., Professor
Robert E. Hodges, M.D., Professor
Lucille S. Hurley, Ph.D., Professor (*Nutrition, Biological Chemistry*)
Jess F. Krauss, Ph.D., Associate Professor
Jo Ann Prophet, M.S., Lecturer
Robert B. Rucker, Ph.D., Associate Professor
Barbara O. Schneeman, Ph.D., Assistant Professor
Judith S. Stern, Sc.D., Assistant Professor
Helene Swenerton, Ph.D., Lecturer
Joyce A. Vermeersch, Ph.D., Assistant Professor
William C. Weir, Ph.D., Professor
Gaylord P. Whitlock, Ph.D., Lecturer
Frances J. Zeman, Ph.D., Professor

Nutrition Science

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.

The number of students in this major may have to be restricted due to limitations in resources.

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.)

†To fulfill the academic requirements for an internship in Dietetics, choose the following courses from the categories in which they appear above: English 1, Rhetoric 1, Psychology 1, Sociology or Anthropology 2, Economics 1A, Physics 2A, 2B, 2C; Food Science and Technology 100A, 100B, Nutrition 110, 111, 111L, 116A, 116B, 190 and 114 or 117. The following courses must be added: Agricultural Economics 112; Food Science and Technology 100AL, 100BL; Consumer Technology 31, 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.

NOTE: For key to footnote symbols, see page 132.

either biochemistry or physiological chemistry. Not open for credit to students who have taken courses 110 or 111. A practical approach to the problems of meeting the nutritional needs of healthy people throughout the life cycle.

	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 (Mathematics 13)	4
Written or oral expression (choose from English 1, 2, 5F, 5P and/or Rhetoric 1)	8
Depth Subject Matter	20
Select from Nutrition 110, 111, 111L, 114, 116A, 116B, 117, 121, 122, 123, 190, 198, and 199.	20
Breadth Subject Matter	20
Courses in social sciences and humanities.	20
Restricted Electives	46
Biochemistry laboratory (Biochemistry 101L, 122, 123)	3-5
Calculus or physics (excluding Physics 10)	6
Foods and food science	6
Physiology with laboratory (Physiology 101, 101L, 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

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 101.

Graduate Adviser. See *Class Schedule and Room Directory*.

COURSES IN NUTRITION

Lower Division Courses

10. Discoveries and Concepts in Nutrition (3) II, III. Hill
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.

93. Public Issues in Nutrition and Food Science (1) II. Weir
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. (Same course as Food Science and Technology 93.) (P/NP grading only.)

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, Canolty
Lecture—5 hours. Prerequisite: Chemistry 8B; Physiology 101 or 2. Not open for credit to students who have taken courses 110 or 111. An introduction to the metabolism of protein, fat, and carbohydrate; the role of vitamins and minerals; food utilization.

102. Nutrition in the Life Cycle (3) II. Canolty
Lecture—3 hours. Prerequisite: course 101 or a course in

102L. General Nutrition Laboratory (1) II. Canolty
Discussion—1 hour; laboratory—2 hours. Prerequisite: course 102 (should be taken concurrently). Laboratory study of the principles of nutrition; study of the nutrients and their chemical and physiological roles in metabolism. Not open for credit to students who have taken course 111L.

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. Robinson (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) III. Stern
Laboratory—3 hours. Prerequisite: course 110. Laboratory study of the chemical and physiological roles of nutrients in metabolism; use of experimental animals in determining the essentiality and function of nutrients.

114. Nutrition and Development (4) II. Hurley
Lecture—4 hours. Prerequisite: course 110 or 102. Role of nutritional factors in embryonic and postnatal development. Offered in odd-numbered years.

116A-116B. Diet Therapy (3-3) I-II. Zeman, Clifford, Stern
Lecture—3 hours. Prerequisite: course 111 or 102; Physiology 101 (or the equivalent). Biochemical and physiological bases for therapeutic diets. Problems in planning diets for normal and pathological conditions.

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. Vermeersch
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.

118L. Laboratory in Community Nutrition (1) II. Vermeersch
Laboratory—3 hours. Prerequisite: course 118 (must be taken concurrently). Observation and evaluation of various community nutrition programs.

119. Field Work in Community Nutrition (3) II, III. Vermeersch, Grivetti
Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 118, 118L; consent of instructor. Student participation in community nutrition programs in public, private, and volunteer agencies and in citizens' groups with active nutrition programs. Analysis of the methods used and evaluation of the effectiveness of the programs. Restricted opportunity for field study may limit enrollment.

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

Oriental Languages

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: a course in nutrition; Physiology 101. Study of nutrient utilization as influenced by the unique aspects of digestion and fermentation in the ruminant.

122L. Ruminant Nutrition Laboratory (2) III. Morris (Animal Science)

Laboratory—6 hours. Prerequisite course 122 (concurrently), and consent of instructor. 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) Robinson (Animal Science), Kratzer (Avian Sciences)

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.

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.

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. The Staff (Rucker in charge)

Lecture—4 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry 101B or Physiological Sciences 101B, Physiology 101. 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 101B or Physiological Sciences 101B; Physiology 101. 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 101B or Physiological Sciences 101B, Physiology 101. 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.

216. Advanced Diet Therapy (3) III. Zeman

Lecture—3 hours. Prerequisite: graduate standing, course 116A-116B, Physiology 110A-110B-110C. 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. The Staff (Vermeersch in charge)

Discussion—1 hour; field work. Prerequisite: courses 118, 118L, 119; graduate standing; consent of instructor. Di-

rected experience in community nutrition. Organization and implementation of nutrition programs.

*250. Concepts of Animal Nutrition (3) I.

Lecture—3 hours. Prerequisite courses 201, 202, 203. Dynamic interrelationships between food animals and environment including concepts in food intake, digestion, absorption, and utilization of nutrients.

*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 Sciences)

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 Sciences)

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 (10-12) I, II, III, IV. The Staff (Zeman in charge)

Lecture—3 hours; seminar—1 hour; laboratory—9 hours; discussion periods and supervised research. Prerequisite: graduate standing; consent of instructor. Directed teaching in approved dietetic internships.

290. Beginning Nutrition Seminar (1) I, II, III. The Staff (Peterson, Avian Sciences, 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. The Staff (Morris, 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.)

Oriental Languages

(College of Letters and Science)

(Department of Anthropology)

Department Office, 328 Young Hall

Faculty

Donald Gibbs, Ph.D., Assistant Professor

Key H. Kim, Ph.D., Assistant Professor

Benjamin E. Wallacker, Ph.D., Professor

Michiko Wilson, M.A., Lecturer

Related Courses. See Art 1D; Asian American Studies 1C-2C-3C, 4C-5C-6C; Comparative Literature 52A-52B, 170A-170B-170C-170D; Religious Studies 170.

COURSES IN ORIENTAL LANGUAGES

Lower Division Courses

1J-2J-3J. Elementary Modern Japanese (5-5-5) I-II-III.

Lecture—3 hours; laboratory—3 hours. Not open for credit to students who have completed the first two years of high school Japanese.

1M-2M-3M. Elementary Modern Mandarin (5-5-5) I-II-III.

Wallacker
Lecture—3 hours; laboratory—3 hours. Introduction to the "National Language" (Kuo Yu) of China. Not open for credit to students who have completed the first two years of high school Mandarin.

4J-5J-6J. Intermediate Modern Japanese (5-5-5) I-II-III.

Kim
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 3J. Continuation of course 3J.

4M-5M-6M. Intermediate Modern Mandarin (5-5-5) I-II-III.

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 3M. Continuation of course 3M.

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) III. 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.

101. Classical Chinese (4) I, II. Wallacker
Lecture—3 hours; term paper. Prerequisite: course 6M. Readings in selected texts. May be repeated twice for credit. Offered if sufficient number of students enroll.

111. Advanced Chinese (4) I, II, III.

Lecture—3 hours; discussion—1 hour Prerequisite course 6M. Readings in modern and contemporary Chinese texts. May be repeated twice for credit.

121. Advanced Japanese (4) I, II, III. Kim

Lecture—3 hours; discussion—1 hour Prerequisite: course 6J. Practice in reading modern Japanese, and introduction to classical Japanese. May be repeated twice for credit.

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 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 (1-3)

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 (see *Class Schedule and Room Directory* course listing) or to the College Office, 228 Mrak Hall.

Lower Division Course**1. Orientation** (no credit) I, II, III. The Staff

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 R. Cordy, D.V.M., Ph.D., Acting Chairperson of the Department

Donald L. Dungworth, B.V.Sc., Ph.D., Chairperson of the Department

Department Office, 1126 Haring Hall

Faculty

Donald R. Cordy, D.V.M., Ph.D., Professor

¹Donald L. Dungworth, B.V.Sc., Ph.D., Professor

David H. Gribble, D.V.M., Ph.D., Associate Professor

Lynn A. Griner, D.V.M., Ph.D., Lecturer

Charles A. Holmberg, D.V.M., Ph.D., Adjunct

Assistant Professor

Thomas G. Kawakami, Ph.D., Adjunct Associate Professor

¹Peter C. Kennedy, D.V.M., Ph.D., Professor

Jack E. Moulton, D.V.M., Ph.D., Professor

Bennie I. Osburn, D.V.M., Ph.D., Professor

¹Roy R. Pool, Jr., D.V.M., Ph.D., Associate Professor

Lester W. Schwartz, D.V.M., Ph.D., Adjunct

Assistant Professor

William L. Spangler, D.V.M., Ph.D., Adjunct Assistant Professor

Anthony A. Stannard, D.V.M., Ph.D., Associate Professor (*Medicine*)

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

Lecture—3 hours; laboratory—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.

283. Tumor Biology (3) I. Dungworth, Faulkn, Kawakami, Theilen, Cardiff, Benjamini, Goldman, Troy

Lecture—3 hours. Prerequisite: graduate student standing and consent of instructor. Growth, invasion and metastasis of tumors; mechanisms of carcinogenesis; intrinsic and extrinsic etiologic factors. Offered in odd-numbered years.

284. Pathology of Reproductive Failure (2) III. Kennedy, Osburn

Lecture—2 hours. Prerequisite: graduate student standing or final year veterinary student and consent of instructor. Selected topics on cause and effects of fetal disease. Offered in odd-numbered years.

285. Neuropathology (3) II. Cordy

Lecture—3 hours. Prerequisite: graduate student standing or final year veterinary student and consent of instructor. Patterns of nervous tissue reaction in disease. Offered in odd-numbered years.

290. Seminar in Veterinary Pathology (1) I, II, III. The Staff

(Osburn in charge)

Seminar—1 hour. (S/U grading only.)

291. Histopathology Conference (1) I, II, III. The Staff (Gribble 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 (Gribble 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. Gribble, 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 (1-4) 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.)

Pediatrics

See Medicine

Pharmacology

See Medicine

Pharmacology and Toxicology (A Graduate Group)

Theodore C. West, Ph.D., Chairperson of the Group
Group Office, 204A Surge IV

Faculty

Theodore C. West, Ph.D., Professor (*Medical Learning Resources, Pharmacology*)

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 graduate adviser or the group Chairperson. See also page 101.

Graduate Advisers. W. W. Kilgore (Environmental Toxicology), E. K. Killam (Pharmacology, Medicine), R. M. Joy (Physiological Sciences).

COURSE IN PHARMACOLOGY AND TOXICOLOGY

Graduate Course

290. Seminar (1) I, II, III. The Staff (West in charge)
Prerequisite: consent of instructor. Current topics in pharmacology and toxicology. (S/U grading only.)

Philosophy

(College of Letters and Science)

William H. Bossart, Ph.D., Chairperson of the Department
Department Office, 308 Voorhies Hall

Faculty

Ronald A. Arbini, Ph.D., Associate Professor
Fred R. Berger, Ph.D., Associate Professor
William H. Bossart, Ph.D., Professor
Arthur Child, Ph.D., Professor
Peter Eggenberger, Ph.D., Lecturer
Joel I. Friedman, Ph.D., Associate Professor
Neal W. Gilbert, Ph.D., Professor
*Marjorie Grene, Ph.D., Professor
John F. Malcolm, Ph.D., Associate Professor
Michael V. Wedin, Ph.D., Assistant Professor

The Major Program

The program in philosophy offers an opportunity to work intensively in the history of philosophy as well as in the major developments of contemporary thought in both the analytic and continental traditions.

Philosophy

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	16
Philosophy 12A, 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 Adviser. F. R. Berger.

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

6. Introduction to Philosophy (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Political, aesthetic, religious, metaphysical, and other concerns of philosophy, as exemplified in major works from various periods.

***6F. Freshman Seminar in Philosophy** (4) I, Grene
Seminar—4 hours. Prerequisite: consent of instructor. Intensive introduction to philosophical inquiry. Open only to freshmen with strong interest or background in philosophy.

12A. Introduction to Logic (4) I, Berger
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.

12B. Introduction to Logic (4) II, Friedman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 12A 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.

14. Ethical and Social Problems in Contemporary Society (4) III, Berger
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.

15. Basic Religious Concepts (3) I, Gilbert
Lecture—3 hours. Prerequisite: Religious Studies 10 recommended. An introductory philosophical examination of certain central religious themes, such as sin, guilt, suffering, sacrifice, mysticism, and salvation. Emphasis will be on the conceptual clarification of religious experience rather than on theological formulation or argument.

21. History of Philosophy: Ancient (4) I, Wedin
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, Grene
Lecture—3 hours; discussion—1 hour. Selections from Descartes, Spinoza, Leibniz and Hobbes.

23. History of Philosophy: Eighteenth Century (4) III, Eggenberger
Lecture—3 hours; discussion—1 hour. Selections from Locke, Berkeley, Hume, and Kant.

Upper Division Courses

101. Metaphysics (4) II, Gilbert
Lecture—3 hours. Prerequisite: two courses in philosophy to be chosen from the 21, 22, 23 sequence and the upper division course list with the exception of 105, 114A, 114B, 117, 123. Theories of being. Such topics as reality, sub-

stance, 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) III, Friedman
Lecture-discussion—3 hours. Prerequisite: two courses in philosophy to be chosen from the 21, 22, 23 sequence and the upper division course list with the exception of 105, 114A, 114B, 117, 123. 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 odd-numbered years.

105. Philosophy of Religion (4) I, Child
Lecture—3 hours. Prerequisite: two courses in philosophy. 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; written papers. Prerequisite: one philosophy course or a major in science. 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. Conceptual Problems in the Biological Sciences (4) III, Grene
Lecture—3 hours; term paper. Prerequisite: a major in a biological science or one philosophy course. The nature of theories, explanations and models in biology. Problems of evolutionary theory and taxonomy. (Same course as Zool-ogy 146.)

***109. Philosophy of the Social Sciences** (4) III, Berger
Lecture-discussion—3 hours; written reports. Prerequisite: one philosophy course or major in a social science. 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.

114A. Introduction to Ethics (4) I, Arbini
Lecture—3 hours; term paper. Prerequisite: one course in philosophy. 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—3 hours; term paper. Prerequisite: course 114A or consent of instructor. 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) III, Berger
Lecture-discussion—3 hours. Prerequisite: course 6 or 6F recommended. Intensive examination of some central concepts of political thought such as the state, sovereignty, rights, obligation, freedom, law, authority, and responsibility. Offered in odd-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 odd-numbered years.

123. Aesthetics (4) I, Child
Lecture—3 hours. Prerequisite: one course in philosophy; one course in music, the plastic arts, or literature. 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) I, Eggenberger

Lecture-discussion—3 hours; term paper. Prerequisite: course 12A 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 Gödel's incompleteness results. Offered even-numbered years.

132. History of Logic (4) II, Malcolm

Lecture-discussion—3 hours; term paper or conferences. Study of special problems or authors in the history of logic. Offered in odd-numbered years.

134. Metalogic (4) II, Friedman

Lecture-discussion—3 hours. Prerequisite: course 12B or consent of instructor. Systematic treatment of formal languages and metalanguages; theorems about theorems of logic; consistency and completeness of formal systems; theory of models of formal systems. Offered in even-numbered years.

137. Philosophy of Language (4) III, Arbini

Lecture-discussion—3 hours. Prerequisite: course 23, 156, or Linguistics 35 recommended. 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) II, 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 even-numbered years.

151. Philosophy of the Nineteenth Century (4) III, Eggenberger

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) II, Berger

Lecture-discussion—3 hours. Prerequisite: course 6 or 6F 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—3 hours; term paper. Prerequisite: course 23 or 151 recommended. Interpretation and analysis of the most influential works of Bertrand Russell, G. E. Moore, Wittgenstein, J. L. Austin, and G. Ryle. Offered in even-numbered years.

157. Special Topics in Contemporary British and American Philosophy (4) II, Arbini

Lecture—3 hours; term paper. Prerequisite: course 155 or 156. Intensive study of special topic or special author in contemporary British or American philosophy. May be repeated for credit with consent of instructor. Offered in odd-numbered years.

158. Phenomenology (4) II, Bossart

Lecture-discussion—3 hours. Prerequisite: course 23, 151, or 175A-175B recommended. Husserl, his predecessors and successors. Offered in even-numbered years.

159. Existentialism (4) III, Grene

Lecture-discussion—3 hours. Prerequisite: course 23, 151, or 175A-175B recommended. Such twentieth-century thinkers as Jaspers, Marcel, Sartre, Merleau-Ponty. Offered in even-numbered years.

160. Special Topics in Contemporary European Philosophy (4) III, Grene

Lecture-discussion—3 hours. Prerequisite: course 158 or 159 recommended. Intensive study of special topic or author from the general fields covered by courses 158 and 159. May be repeated for credit with consent of instructor. Offered in odd-numbered years.

161. Plato (4) III, Wedin

Lecture-discussion—3 hours. Prerequisite: course 21. Offered in even-numbered years.

162. Aristotle (4) III, Malcolm

Lecture-discussion—3 hours. Prerequisite: course 21 or consent of instructor. Offered in odd-numbered years.

168. Descartes (4) II, 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) II, Gilbert

Lecture-discussion—3 hours; term paper. Prerequisite: course 22. Offered in even-numbered years.

***171. Hobbes** (4) II, Gilbert

Lecture-discussion—3 hours; term paper. Prerequisite: course 22 recommended. Offered in odd-numbered years.

172. Locke (4) III, Malcolm

Lecture-discussion—3 hours. Offered in odd-numbered years.

***173. Berkeley** (4) II, _____

Lecture-discussion—3 hours; term paper. Prerequisite: course 23. Offered in odd-numbered years.

174. Hume (4) III, Arbini

Lecture-discussion—3 hours. Offered in even-numbered years.

175A. Kant (4) I, Bossart

Lecture-discussion—3 hours; written reports. Prerequisite: course 23. Offered in even-numbered years.

175B. Kant (4) II, Bossart

Lecture-discussion—3 hours; written reports. Prerequisite: course 175A. Offered in odd-numbered years.

176. Hegel (4) I, Bossart

Lecture-discussion—3 hours. Prerequisite: courses 23, 175A-175B recommended. Offered in odd-numbered years.

178. Kierkegaard (4) I, Child

Lecture—3 hours. Prerequisite: course 21 and course 23 or 185. Offered in odd-numbered years.

181. Heidegger (4) III, Child

Lecture-discussion—3 hours. Prerequisite: course 23, 151, or 175A-175B recommended. Offered in odd-numbered years.

185. Founders of Modern Thought (4) II, Gilbert

Lecture-discussion—3 hours; term paper. Not open to philosophy majors or students who have had course 22 or 23. Survey of modern philosophy from Descartes to Kant. Major emphasis upon problems still current today.

190. Special Topics in the History of Philosophy (4) II, Eggenberger

Lecture—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 (Bossart in charge) (P/NP grading only.)**199. Special Study for Advanced Undergraduates** (1-5) I, II, III, The Staff (Bossart 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 permission 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) I, Arbini
Seminar—3 hours.***206. Philosophical Argumentation** (4) II.

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) II, Berger
Seminar—3 hours.**223. Aesthetics** (4) II.

Seminar—3 hours. Offered in even-numbered years.

261. Plato (4) I, Malcolm

Seminar—3 hours. Offered in even-numbered years.

262. Aristotle (4) III, Wedin

Seminar—3 hours. Offered in odd-numbered years.

***275. Kant** (4) II, Bossart

Seminar—3 hours. Offered in odd-numbered years.

290. History of Philosophy (4) I, III, Gilbert, Bossart

Seminar—3 hours. Special topics in the history of philosophy.

298. Group Study (1-5) I, II, III, The Staff (Bossart in charge)**299. Research** (1-12) I, II, III, The Staff (Bossart in charge) (S/U grading only.)**Physical Education**

(College of Letters and Science)

Edmund M. Bernauer, Ph.D., Chairperson of the Department

Herbert A. Schmalenberger, M.A.,
Vice-Chairperson of the Department
Department Office, 264 Gymnasium

Faculty

William C. Adams, Ph.D., Associate Professor
Edmund M. Bernauer, Ph.D., Professor
Robert R. Brooks, M.A., Supervisor
Joseph E. Carlson, M.A., Supervisor
Suzanne Cumnock, Ed.M., Associate Supervisor
Jere H. Curry, M.A., Supervisor
Rudy H. Dressendorfer, Ph.D., Lecturer
Robert L. Foster, M.A., Associate Supervisor
Pamela Gill, A.B., Assistant Supervisor
Raymond S. Goldbar, M.A., Assistant Supervisor
Robert I. Hamilton, M.S., Supervisor
Jerry W. Hinsdale, A.B., Supervisor
Charles R. Kovacic, Ed.D., Professor
Willard S. Lotter, Ed.D., Professor
Barbara A. Luick, M.S., Assistant Supervisor
Penny D. McCullagh, Ph.D., Lecturer
John W. Pappa, M.A., Supervisor
Melvin R. Ramey, Ph.D., Associate Professor (*Civil Engineering*)

¹E. Dean Ryan, Ed.D., Professor
Herbert A. Schmalenberger, M.A., Supervisor
Joe L. Singleton, M.A., Supervisor
^{3,4}James L. Sochor, Ed.D., Supervisor

NOTE: For key to footnote symbols, see page 132.

Physical Education

3-4 Phillip S. Swimley, M.A., Supervisor
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 human movement. The major provides the basic education for students planning careers in the area of teacher education, physical, occupational, recreational, or corrective therapy, and other allied health and sport sciences which demand knowledge of human movement.

Physical Education

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter (for both Biological and Psychosocial emphases)	25
Biological Sciences 1	5
Chemistry 1A	5
Mathematics 13	4
Physical Education 45	4
Physics 2A	3
Psychology 1	4
Depth Subject Matter	45
Biological Emphasis:	
Human Anatomy 101	5
Physiology 101	5
Physical Education 103, 104A, 104B, 110, 120, 135	23
At least 12 additional upper division units in Physiology or Zoology, selected in consultation with major adviser	12
Total Units for the Major (Biological Emphasis)	70
Depth Subject Matter	45-48
Psychosocial Emphasis:	
Human Anatomy 101	5
Physiology 101	5
Physical Education 103, 104A, 104B, 110, 120, 135	23
At least three additional upper division courses in psychology or sociology, selected in consultation with major adviser	12-15
Total Units for the Major (Psychosocial Emphasis)	70-73
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.	
Teaching Major. The teacher-training curriculum in physical education requires in addition to the departmental major requirements, course 130, 180, and 380B.	
Teaching Credential Subject Representative. H. A. Schmalenberger. See page 107 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. E. M. Bernauer.

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. Sections in archery, aerobics, badminton, baseball, basketball, bowling, dance (ballet, modern, social, folk and square), field hockey, football, golf, gymnastics, handball, racquet ball, rifle, soccer, swimming, swimming aerobics, tennis, track, trampolining, tumbling, volleyball, weight training, wrestling. (Men qualified for I.C.A. athletics and women qualified for W.A.A. athletics may enroll in any sport pursued at Davis, such as baseball, basketball, football, or tennis, and receive credit.) This course may be repeated for credit not to exceed a total of 6 units. (P/NP grading only.)

5. Foundations of Emergency First Aid Services (2) I, II, III. Pappa
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.

10. Professional Physical Education Activities (1) I, II, III. The Staff (Bernauer in charge)
Lecture—1 hour; laboratory—2 hours. Fundamental skills in aquatics, aerobics, archery, badminton, baseball, basketball, field hockey, football, gymnastics, handball, rhythms, softball, tennis, track and field, trampolining, weightlifting, wrestling, and volleyball.

15. Administration of Intramural Sports (2) II. 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. Hinsdale
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. Lecture—2 hours; laboratory—2 hours; two 8-hour field trips to the ocean. Prerequisite: advanced swimming skills equivalent to course 25; diver medical examination; and consent of instructor. Development of physical skills and knowledge required for S.C.U.B.A. diving, function and maintenance of equipment, physics and physiology of

diving, safety and first aid, currents and wave action, marine life and underwater communication. (P/NP grading only.)

35. Dance Composition (2) I, II. Curry
Laboratory—4 hours. Principles of choreography for solo and group compositions.

36A-36B. History of Dance (3-3) I-II. 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 knowledge to personal, family, and community health problems. (P/NP grading only.)

45. Foundations of Physical Education (4) I, III. Adams
Lecture—4 hours. An introduction to the historical, biological, psychological, sociological and philosophical 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 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.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

103. Analysis of Human Movement (5) I, III. Kovacic
Lecture—4 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1; Physiology 101; course 45 or consent of instructor. Anatomical and physiological concepts and physical laws as applied to human movement.

104A-104B. Physiology of Muscular Activity (3) I-II. Bernauer
Lecture—2 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1; Physiology 101; course 45 or consent of instructor. Circulatory-respiratory and metabolic response to exercise in man under various physiological and ambient conditions.

105. Physical Education for the Handicapped (4) II. Kovacic
Lecture—4 hours. Prerequisite: course 103. The role of exercise, physical retraining and remedial work in the improvement of movement for handicapped individuals.

106. Environmental Effects on Physical Performance (3) II. Adams, Bernauer
Lecture—2 hours; discussion—5 1-hour sessions; laboratory—5 2-hour sessions. Prerequisite: course 104B or consent of instructor. A survey of the effects of thermal, barometric and gravitational conditions on the physical performance and physiological function of human beings. Acute and chronic effects will be studied, with emphasis placed on physiological limitations and adaptations.

110. Psychosocial Factors in Motor Performance (4) I, II. McCullagh
Lecture—3 hours. Prerequisite: Psychology 1, 15; course 45 or consent of instructor. Analysis of various psychological and social factors affecting the development and use of motor skills.

115. Growth and Development in Human Performance (4) II. Dressendorfer
Lecture—4 hours. Prerequisite: Biological Sciences 1, Physiology 2, and Human Anatomy 101. Development of human performance potential from conception to old age, including influence of racial differences, exercise, athletic participation, and preventive medicine. Alterations in motor skill patterns, morphology and body composition, physiological capacities, coordination, and balance with aging.

120. Sports in American Society (4) III. Welch

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.

125. Human Performance and Motor Learning (4) III. McCullagh

Lecture—3 hours; laboratory—2 hours. Prerequisite: course 110, Psychology 1; Psychology 130 recommended. The process of skill acquisition, with consideration given to open and closed loop theory, attention, automaticity, kinesiology, movement control, and learning. Proprioception and intrinsic feedback mechanism are also discussed. Laboratory illustrations are offered when practicable.

130. 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.

135. Design and Program Evaluation in Physical Education (4) III. Dressendorfer

Lecture—3 hours; laboratory—3 hours. Prerequisite: basic statistics course; courses 103, 104A, 110 or consent of instructor. Topics include data reduction and analysis; test selection, construction and administration; grading; and teacher evaluation.

140. Recreation in the Community (3) I, Lotter

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.

171. 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.

172. Conditioning of Athletes: The Prevention and Care of Sports Injuries (1) I, Pappa

Laboratory—3 hours. Prerequisite: a major or minor in Physical Education; American Red Cross Advanced First Aid Card. Prevention and care of injuries; adhesive strapping, protective devices, and injury care therapies. Training and first aid room organization, equipment, and supplies.

180. Physical Education in the Public Schools (3) I, Cumnock

Lecture—3 hours. Prerequisite: course 130 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.

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, McCullagh

Seminar—3 hours. Prerequisite: course 135. 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.

***210. Historical and Cultural Bases of Physical Education** (3) I.

Lecture—2 hours; discussion—1 hour. Prerequisite: course 120. An examination of political, economic, social, and religious factors which have influenced sports in various countries and cultures.

215. Growth and Development in Human Performance (4) III. Wilmore

Seminar—4 hours. Prerequisite: course 115. 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. Critical review of current literature and research in kinesiology; neurophysiological concepts and physical laws.

221. Anthropometry in Relation to Physical Performance (4) II. Adams

Lecture—2 hours; discussion—1 hour; laboratory—2 hours. Prerequisite: courses 104B and 135. Consideration of physical constitution, body proportions, and body composition in man as they affect physical performance; measurement of selected structural and functional changes accompanying prolonged, systematic physical conditioning.

222. Metabolic Functions in Exercise (4) III. Bernauer

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 104B, Physiology 110C. 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. McCullagh

Lecture—2 hours; discussion—2 hours. Prerequisite: course 110. Critical review of current literature on motor learning; coordination; kinesiology; and reaction time; consideration of sensory-motor perception, motivation, and personality factors in relation to physical activities.

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.

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) II. Schmalenberger

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 180 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

Physical Sciences

(College of Letters and Science)

Program Office, 225 Physics-Geology Building

Committee in ChargeRoderick V. Reid, Jr., Ph.D. (*Physics*); Committee ChairpersonR. Bryan Miller, Ph.D. (*Chemistry*)Kenneth L. Verosub, Ph.D. (*Geology*)

The Major Programs

This major is designed to give a foundation in the principal physical science fields without requiring a high degree of specialization restricted to one area. A strong major is an excellent base for later work in the newer interdisciplinary fields, e.g., in environmental sciences, geophysics, or geochemistry as well as within one of the physical science fields itself. The major is also appropriate for those who desire a general secondary teaching credential. In order to take advantage of the inherent flexibility of the program, students should consult with a Physical Sciences adviser as early as possible.

Physical Sciences**A.B. Major Requirements:**

	UNITS
Preparatory Subject Matter	43-44
Chemistry 1A-1B-1C or 4A-4B-4C	15
Geology 1-1L or 60-60L	4-5
Mathematics 21A, 21B, 21C	12
Physics 4A, 4C, 4E	12
Depth Subject Matter	36
At least 22 upper division units in one of the following three fields: chemistry, geology, or physics	22
At least 6 upper division units in a second of these fields	6
At least 3 upper division units in the third field	3
Additional upper division units in these three fields to achieve a total of 36 upper division units	5
Total Units for the Major	79-80

Related Fields

Subject to approval by the Physical Sciences Committee, up to 3 units may be substituted from fields related to the three above.

Physical Sciences**B.S. Major Requirements:**

	UNITS
Preparatory Subject Matter	54-57
Chemistry 1A-1B-1C or 4A-4B-4C	15

NOTE: For key to footnote symbols, see page 132.

Physics

Geology 1-1L or 60-60L	4-5
Mathematics 11 (or its high school equivalent)	0-2
Mathematics 21A, 21B, 21C	12
Physics 4A, 4B, 4C, 4D, 4E	20
One course in computer programming (e.g., Mathematics 29 or Engineering 5)	3
Depth Subject Matter	45
At least 22 upper division units in one of the following three fields: chemistry, geology or physics	22
At least 8 upper division units in a second of these fields	8
At least 6 upper division units in the third field	6
Additional upper division units in these three fields to achieve a total of 45 upper division units	9
Total Units for the Major	99-102

Related Fields

Subject to approval by the Physical Sciences Committee, up to 6 units may be substituted from fields related to the three above.

Recommended

Geology 2, 2L, 3, 3L; Mathematics 22A, 22B, 22C. The choice of recommended courses depends on the preparation desired for upper division specialization in the major.

Major Adviser. See *Class Schedule and Room Directory* listing.

Teaching Credential Subject Representative. R. V. Reid. See page 107 for the Teacher Education Program.

Physics

(College of Letters and Science)

Douglas W. McColm, Ph.D., Chairperson of the Department
Department Office, 225 Physics-Geology Building

Faculty

¹Franklin P. Brady, Ph.D., Professor
^{3,4}Thomas A. Cahill, Ph.D., Professor
Albert C. Cheung, M.A., Assistant Professor
Linton R. Corruccini, Ph.D., Assistant Professor
James E. Draper, Ph.D., Professor
Glen W. Erickson, Ph.D., Professor
Ching-Yao Fong, Ph.D., Associate Professor
Milton E. Gardner, Ph.D., Professor Emeritus
¹Claude Garrod, Ph.D., Professor
Kenneth R. Greider, Ph.D., Professor
John F. Gunion, Ph.D., Assistant 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
Richard L. Lander, Ph.D., Professor
Douglas W. McColm, Ph.D., Associate Professor
Charles G. Patten, Ph.D., Professor Emeritus
Neal Peek, Ph.D., Lecturer
David E. Pellett, Ph.D., Associate Professor
Wendell H. Potter, Ph.D., Associate Professor
Thomas M. Powell, Ph.D., Assistant Professor
(*Physics, Environmental Studies*)
Roderick V. Reid, Jr., Ph.D., Associate Professor
William W. True, Ph.D., Professor
Philip M. Yager, Ph.D., Associate Professor

The Major Programs

The Bachelor of Science major program should be followed by the student who plans to enter physics as a profession. The Bachelor of Arts program is less intensive but provides a broad coverage of classical and modern physics and permits more electives in other fields. The A.B. program is preferred for a student seeking a secondary teaching credential (see also Physical Sciences major program). Either program is suitable for those planning careers in an interdisciplinary field such as biophysics, medical physics, and geophysics.

Both programs are developed in a highly sequential manner, i.e., Physics 4A-4B-4C-4D-4E and Mathematics 21A-21B-21C, 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 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	41
Physics 4A, 4B, 4C, 4D, 4E	20
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 a total of 4 units in courses numbered 194, 195, 197T, 198, and 199 may be applied in satisfac- tion of this requirement.)	5
Total Units for the Major	79

Recommended

Chemistry 1A-1B-1C or 4A-4B-4C; Mathematics 24, 118A, 118B, 119, 185A, 185B; Mathematics 129A-129B or Applied Science 115.

Physics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	56
Physics 4A, 4B, 4C, 4D, 4E	20
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 a total of 6 units in courses numbered 194, 195, 197T, 198, and 199 may be applied in satisfac- tion of this requirement.)	10
Total Units for the Major	110

Recommended

Mathematics 24, 118A, 118B, 119, 185A, 185B; Mathematics 129A-129B or Applied Science 115.

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.

Teaching Credential Subject Representative. R. V. Reid. See page 107 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. Further information regarding requirements for these two degrees graduate research, teaching assistantships, and research assistantships may be obtained by writing to the Chairperson, Department of Physics, University of California, Davis 95616.

Astronomy. There is no major program leading to a degree in Astronomy. Introductory courses are offered in general astronomy and astrophysics. Students who wish to use the observatory or the portable telescopes may do so through the Astronomy Club. The graduate program in physics provides research opportunities in radio-astronomy or microwave astrophysics.

COURSES IN ASTRONOMY

Lower Division Courses

2. Introduction to Modern Astronomy and Astrophysics

(4) III. 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 courses 1B or 10.

10. Introduction to General Astronomy (4) I, 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 extraterrestrial communications. Not open to students who have received credit for courses 1B or 2 or any physics course (except 10).

Upper Division Course

127. Introduction to Astrophysics (3) II. Cheung
Lecture—3 hours. Prerequisite: Physics 4C, 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.

COURSES IN PHYSICS

Effective 1976-77:

Physics 10 is primarily a concept-oriented one-quarter lecture/discussion course requiring relatively little mathematical background.

Physics 1 is a two-quarter sequence requiring some mathematics (trigonometry). Either 1A alone or both 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 1A (same formal description as the present 2A) will be offered Winter Quarter.

Physics 1B (3 units; heat, optics, radiation; prerequisite 1A or 2A) will be offered Spring Quarter.

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 4 is a five-quarter sequence using calculus throughout and including laboratory work as an integral part. The entire sequence is recommended, rather than just alternate quarters. The course is designed primarily for students in the physical sciences and engineering.

(See "Changes to General Catalog," published each quarter, for courses which have changed from those shown below.)

Note: Faculty listed for each course are well acquainted with the course, but may not teach it this year.

Lower Division Courses

2A. General Physics Lecture (3) I, II. The Staff
Lecture—3 hours. Prerequisite: trigonometry or consent of instructor. Mechanics. Not open to students who have completed course 5A.

2B. General Physics Lecture (3) II, III. The Staff
Lecture—3 hours. Prerequisite: course 2A or 5A. Electricity and magnetism, heat, kinetic theory, and thermodynamics. Not open to students who have completed course 5B.

2C. General Physics Lecture (3) I, III. The Staff
Lecture—3 hours. Prerequisite: course 2B or 5B. Wave motion, optics, modern physics. Not open to students who have completed course 5C.

3A. General Physics Laboratory (1) I, II. The Staff
Laboratory—2 hours. Prerequisite: course 2A (may be taken concurrently). Mechanics. Experimental work planned to accompany the lectures in course 2A. Recommended for all students who take course 2A.

3B. General Physics Laboratory (1) II, III. The Staff
Laboratory—2 hours. Prerequisite: course 2B (may be taken concurrently) and either course 3A or 5A. 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 2C (may be taken concurrently), and either course 3A or 5A. Wave motion, optics, modern physics. Experimental work planned to accompany the lectures in course 2C. Recommended for all students who take course 2C.

4A. General Physics (4) II, III. McCole
Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 21B (may be taken concurrently). Mechanics.

4B. General Physics (4) III. Corruccini
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4A; Mathematics 21C (may be taken concurrently). Properties of many body systems; rigid body motion, hydrodynamics, kinetic theory, thermodynamics and statistical physics.

4C. General Physics (4) I, Gunion, Pellett
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4A; Mathematics 21C, 22C (may be taken concurrently); course 4B recommended. Fundamentals of electromagnetic theory; Maxwell's equations.

4D. General Physics (4) II. Yager
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4C; Mathematics 22B (may be taken concurrently). Fundamentals of electromagnetic theory (continuation of course 4C); A.C. circuitry, electromagnetic waves, optics, electric and magnetic fields in matter.

4E. General Physics (4) III. Reid
Lecture—3 hours; discussion-quiz—2 hours. Prerequisite: course 4C; course 4D and Mathematics 22A recommended. Physics since 1900; special relativity, quantum mechanics, atoms, molecules, the solid state, nuclei, and particle physics.

***5A. General Physics** (4) I. The Staff
Lecture—3 hours; laboratory—2 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 completed course 2A.

***5B. General Physics** (4) II. The Staff
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 5A (or 2A, 3A, Mathematics 16A, and consent of instructor). Electricity and magnetism, heat, kinetic theory and thermodynamics. Not open to students who have completed course 2B.

***5C. General Physics** (4) III. The Staff
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 5B (or 2B, 3B, Mathematics 16A, and consent of instructor). Wave motion, optics, modern physics. Not open to students who have completed course 2C.

10. Basic Concepts of Physics (4) I, II, III. 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 the basic principles of physics and how they have evolved since the time of Copernicus. Includes lecture-demonstrations and problem solving using elementary algebra.

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 4C; 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 4A; Mathematics 22A, 22B, 22C. Principles and applications of Newtonian mechanics.

105B. Analytical Mechanics (3) II. Ko
Lecture—3 hours. Prerequisite: courses 4B and 105A. Continuation of course 105A; introduction to Lagrange's and Hamilton's equations.

105C. Analytical Mechanics (3) III. Powell
Lecture—3 hours. Prerequisite: course 105B. Continuation of course 105B.

110A-110B-110C. Electricity and Magnetism (3-3-3) I, II, III. Jungerman, Reid
Lecture—3 hours. Prerequisite: course 4D; Mathematics 22C. Theory of electrostatics, electromagnetism, Maxwell's equations, electromagnetic waves.

112A-112B. Thermodynamics and Statistical Physics (3-4) I, II. Corruccini
Lecture—3 hours; (112A); lecture—3 hours plus 9 hours outside work (112B). Prerequisite: course 4; Mathematics 22C. Thermodynamics, kinetic theory, and introduction to statistical mechanics.

115A-115B. Introduction to Quantum Mechanics (3-4) III, I, Draper
Lecture—3 hours; (115A); lecture—3 hours plus problem sets (115B). Prerequisite: courses 4E, 104B, 105B. The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.

116A. Electronic Instrumentation (4) I, Pellett
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 4D, Mathematics 22C; course 104B and partial differential equations and Laplace transforms recommended. An experimental and theoretical study of important electronic circuits commonly used in physics.

116B. Electronic Instrumentation (2) II. Cahill
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 116A. Continuation of course 116A with special emphasis on recent developments in semiconductor circuitry.

121. Foundations of Atomic and Molecular Physics (4) III. McCole
Lecture—3 hours; outside work—9 hours. Prerequisite: course 4E; 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) II, Corruccini, III, Cahill
Discussion—1 hour; laboratory—3-6 hours. Prerequisite: course 4. 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.

129A. Introduction to Nuclear and Particle Physics (4) II. Lander
Lecture—3 hours; term paper. Prerequisite: course 4E; Mathematics 22C. Survey of basic nuclear properties and concepts requiring only rudimentary knowledge of quantum mechanics.

129B. Nuclear Physics (4) III. 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. Potter
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. Potter
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.

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 of 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.)

Physiological Sciences

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.

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.

***221A-221B-221C. Atomic Physics** (3-3-3) I, II, III, McColm
Lecture—3 hours. Prerequisite: course 215C. 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.

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) II, III, Fong
Lecture—3 hours. Prerequisite: course 221A-221B. One electron model of solids. Properties of lattice waves. Optical and magnetic properties of solids. Fermi surface. Superconductivity. Not offered every year.

***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.

***251. Frontier Physics** (3) II, Reid
Lecture—3 hours. Prerequisite: courses 200C, 215B; or consent of instructor. Provides an introduction to and summary of the types of research that are of current interest in physics and a detailed analysis of a particularly important recent discovery in each major area.

252. Techniques of Experimental Physics (3) III, Draper
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.)

297. Techniques of Teaching Physics (3) II, 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 (1-12) 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

Faculty

Allen C. Andersen, V.M.D., Ph.D., Lecturer
Richard L. Bell, Ph.D., Associate 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
(*Physiological Sciences, Human Physiology*)
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
Alfred A. Heusner, Docteur-es-Sciences, Professor
Robert M. Joy, Ph.D., Assistant Professor
James G. Morris, Ph.D., Professor (*Animal Science*)
Harold R. Parker, D.V.M., Ph.D., Associate Professor (*Surgery*)
Stuart A. Peoples, M.D., Professor Emeritus
Quinton R. Rogers, Ph.D., Professor
Henry J. Segall, Ph.D., Assistant Professor
Robert E. Smith, Ph.D., Professor Emeritus

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, Freedland
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 genetic 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—3 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 former 140A-140B 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. Stormont
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.

***256. Medical Toxicology** (3) II. Conzelman, Giri, Joy
Lecture—3 hours. Prerequisite: course in pharmacology or consent of instructor. Studies considered essential to pre-clinical evaluation of new drugs intended for use in human or veterinary medicine are discussed in depth. The following facets of toxicity tests are covered: hypersensitivity; blood dyscrasias; hepatotoxicity, nephrotoxicity, behavioral effects; addiction potential; teratogenicity; carcinogenicity.

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.

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.

265. Experimental Physiology (3) I, Parker
Lecture—1 hour; laboratory—6 hours. Prerequisite: consent of instructor. Selected lectures and experiments on cardiovascular, renal and pulmonary mechanisms with emphasis on chronically maintained preparations and perinatal problems. Offered in odd-numbered years.

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.)

Physiology

Also see 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.

Physiology

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	47-48
Chemistry (Chemistry 1A-1B-1C, 5, 8A-8B)	25
Mathematics (Mathematics 13, 16A-16B, 16C or Physiology 108)	13-14
Physics (Physics 2A-2B-2C)	9
Depth Subject Matter	33
Physiology, including Physiology 100A-100B, 100L, 101L, 111A-111B	33
Breadth Subject Matter	
<i>College of Agricultural and Environmental Sciences students</i>	16
English and/or rhetoric, social sciences and/or humanities	16
Additional requirements as described on page 68	
<i>College of Letters and Science students</i>	
Refer to page 92 for a description of requirements to be completed in addition to the major.	
Restricted Electives	30
Upper division units which must include either biochemistry and morphology or mathematics, chemistry, physics, and/or engineering. Program should be developed in consultation with major adviser.	
Unrestricted Electives	53-54
Total Units for the Major	180

Major Adviser. D. E. Woolley.

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 by contacting the graduate adviser or the *Announcement of the Graduate Division*.

Graduate Adviser. M. W. Beal.

COURSES IN PHYSIOLOGY

Lower Division Courses

See also *Physiology 2, 2L, and 10 under Zoology course listing (page 308).*

Upper Division Courses

100A-100B. General Physiology (3-3) I, II. B. Horwitz, J. Horowitz
Lecture—3 hours. Prerequisite: Biological Sciences 1; Chemistry 8B; Physics 2C. Chemical, mathematical, and physical characteristics of the life process common to living things, with particular reference to the cell

100L. General Physiology Laboratory (2) II. B. Horwitz, J. Horowitz
Discussion—five 2-hour sessions (alternate weeks); laboratory—five 6-hour sessions (to alternate with discussion). Prerequisite: courses 100A, 100B (concurrently),

Physiology

Biological Sciences 1; or consent of instructor. Laboratory in the physical and chemical processes of cells and tissues.

101. Function of Organ Systems (5) I, II, III. Boda, Colvin, Goldberg, Mendel

Lecture—5 hours. Prerequisite: Biological Sciences 1. Physiology of organ systems; including concepts of integrative and homeostatic mechanisms.

101L. Organ Function Laboratory (2) I, Goldberg; III, Sillman

Laboratory—6 hours. Prerequisite: course 101 (may be taken concurrently). Selected experiments to illustrate functional characteristics of organ systems discussed in course 101.

102. Physiology of Growth (3) III. A. Smith

Lecture—3 hours. Prerequisite: courses 101 and 101L. Biological, physical, and chemical aspects of the growth of cells, organisms, and populations.

103. Physiology of Animal Cells (4) III. B. W. 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.

107. Avian Physiology (3) III. Ogasawara

Lecture—3 hours. Prerequisite: courses 101 and 101L, or Zoology 2. Physiology of the various systems of birds with emphasis on digestion, respiration, excretion, and the nervous system.

107L. Avian Physiology Laboratory (2) III. Ogasawara, Burger

Laboratory—6 hours. Prerequisite: course 107 (may be taken concurrently); and consent of instructor. Selected problems in the physiology of birds.

108. Biodynamics (3) III. Horowitz

Lecture—3 hours. Prerequisite: course 100A or 101; Mathematics 16A, 16B. Application of mathematics to physiological processes.

110A. Mammalian Physiology: Neuromuscular, Neurophysiology, Autonomics (3) I, Wagman, Burger

Lecture—3 hours. Prerequisite: course 101. Recommended: Chemistry 8B; Physics 2A, 2B, 2C; neuroanatomy and/or course 120A. Physiology of the organ systems of mammals. Neurophysiology—nerve transmission, synaptic transmission, sensory, motor, and central regulatory mechanisms, autonomic nervous system.

110B. Mammalian Physiology: Respiration, Cardiovascular, Renal (3) II. Goldberg, Weidner

Lecture—3 hours. Prerequisite: course 101. Recommended: Chemistry 8B; Physics 2A, 2B, 2C; anatomy and/or physiology. Physiology of the organ systems of mammals. The physiology of renal, respiratory, and cardiovascular systems of mammals.

110C. Mammalian Physiology: Thermoregulation, Digestion, Endocrine, Reproduction (3) III. Mendel, Boda

Lecture—3 hours. Prerequisite: course 101. Recommended: Chemistry 8B; Physics 2A, 2B, 2C; anatomy and/or physiology. Physiology of the organ systems of mammals. The physiology of thermoregulatory, digestive, endocrine, and reproductive systems of mammals.

111A-111B. Mammalian Physiology Laboratory (3-3) II, III. Burger

Lecture—1 hour; discussion—1 hour. Laboratory—3 hours. Prerequisite: course 101; course 110A-110B-110C 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.

120A. Comparative Physiology: Neurointegrative Mechanisms (3) I, Woolley

Lecture—3 hours. Prerequisite: course 101. Comparisons of physiological functions in the animal kingdom; neurophysiological 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 101. Comparisons of physiological functions in the animal kingdom: circulation. Comparative approach to cardiovascular function in invertebrates. Offered in odd-numbered years.

120C. Comparative Physiology (3) III. Colvin

Lecture—3 hours. Prerequisite: course 101. 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 101. Comparisons of physiological functions in the animal kingdom: humoral integrative mechanisms. Offered in even-numbered years.

120E. Comparative Physiology: Respiration (3) II. Smith

Lecture—3 hours. Prerequisite: course 101. 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 101. Comparisons of physiological functions in the animal kingdom: osmoregulatory mechanisms. Offered in odd-numbered years.

121. Physiology of Reproduction (3) III. Cupps

Lecture—3 hours. Prerequisite: course 101. Physiological mechanisms related to reproduction, breeding efficiency, and fertility, with special reference to domestic animals.

121L. Physiology of Reproduction Laboratory (1) III. Cupps

Laboratory—3 hours. Prerequisite: course 121 recommended. Experiments on the reproductive systems of domestic animals including male and female gametes.

130. Physiology of the Endocrine Glands (5) I, Moberg

Lecture—4 hours; discussion—1 hour. Prerequisite: course 101 or 110B. Control of endocrine secretion and the physiological effects of the hormones.

147. Aviation Physiology (3) II. Smith

Lecture—2 hours; discussion—1 hour; field trips—three or four, in lieu of discussions. Prerequisite: course 101. A study of the nature and physiological consequences of the aviation environment—acceleration, altitude, motion, etc., as well as protective equipment (oxygen equipment, G-suits, etc.) and training devices (centrifuges, decompression chambers, etc.). Offered in odd-numbered years.

148. Principles of Environmental Physiology (3) II. Evans, Weathers

Lecture—3 hours. Prerequisite: course 101. 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 101 and 101L, 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.

***161. Topics in Voluntary Control of Physiological Processes** (3) II. The Staff (Mendel in charge)

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 101 or consent of instructor. Physiology of voluntary activity, including voluntary control of involuntary processes as studied by use of bio-feedback systems; topics include electrical activity of the brain, body, temperature, smooth and skeletal muscle tonus, and cardiovascular system.

190. Proseminar in Physiology (3) II. B. W. 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.

197T. Tutoring in Physiology (2) I, II, III. The Staff (Mendel in charge)

Discussion—1 hour; tutorial—1 hour. Prerequisite: course 101 or 110B or 210B (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 101. 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 (Mendel in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Mendel in charge) (P/NP grading only.)

Graduate Courses

200A, 200B. Advanced General Physiology (3,3) I, II. B. W. Wilson

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. W. 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.

***210A-210B. Advanced Systemic Physiology** (3-3) II, Goldberg; III, Moberg

Lecture—3 hours. Prerequisite: course 110A-110B or consent of instructor. Advanced consideration of the physiology of the neuromuscular, circulatory, respiratory, digestive, endocrine, reproductive, and excretory systems.

211. Advanced Systemic Physiology Laboratory (5) III. Horowitz

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 110B. Advanced treatment of systemic physiology, with special emphasis on current developments; laboratory exercises illustrating modern physiological concepts and procedures.

214. Neurophysiology (4) II. Wagman

Lecture—4 hours. Prerequisite: courses 110B, 111B; course 210B recommended. 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) II. Wagman

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. Wagman

Discussion—2 hours. Prerequisite: course 214. Critical reading and group discussion of current and classic original papers in neurophysiology.

219. Muscle Growth and Development (3) I, Ashmore, 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

Lecture—3 hours. Prerequisite: courses 101, 101L; 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.

225. Physiology of Lactation (4) I, Baldwin
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101; 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. Selected Topics in Neuroendocrinology (3) II, Woolley, Moberg
Lecture—2 hours; discussion—1 hour. Prerequisite: course 130 or consent of instructor. Neuroendocrine interactions; neural regulation and endocrine systems; hormonal modifications of neural development and activity. Offered in even-numbered years.

***242. Physiological Rhythmicity** (1) I, Winger
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 (Mendel 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 with a different topic is studied. (S/U grading only.)

290. Seminar (1) I, II, III, The Staff (Mendel 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 (Mendel 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., course 110A-110B-110C). (S/U grading only.)

298. Group Study (1-5) I, II, III, The Staff (Mendel in charge)

299. Research (1-12) I, II, III, The Staff (Mendel 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 including pre-runs when necessary, develop competence in laboratory procedures and techniques, and prepare and correct quizzes. (S/U grading only.)

NOTE: For key to footnote symbols, see page 132.

Plant Pathology

(College of Agricultural and Environmental Sciences)

Tsune Kosuge, 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., Lecturer
W. Harley English, Ph.D., Professor
David G. Gilchrist, Ph.D., Assistant Professor
Austin G. 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., Associate Professor
John M. Klisiewicz, Ph.D., Lecturer
Tsune Kosuge, Ph.D., Professor
Lysle D. Leach, Ph.D., Professor Emeritus
Bert Lear, Ph.D., Professor
Srecko M. Mircetich, Ph.D., Lecturer
William J. Moller, Ph.D., Lecturer
George Nyland, Ph.D., Professor
Joseph M. Ogawa, Ph.D., Professor
William C. Schnathorst, Ph.D., Lecturer
Thomas A. Shalla, Ph.D., Professor
Robert J. Shepherd, Ph.D., Professor
Mary Ann Strand, Ph.D., Assistant 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 101.

Graduate Advisers. E. E. Butler, T. A. Shalla, R. K. Webster.

COURSES IN PLANT PATHOLOGY

Upper Division Courses

120. Introduction to Plant Pathology (4) I, Campbell; III, English
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, Nyland
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, Kosuge
Lecture—3 hours. Prerequisite: Botany 2; Biochemistry 101B, 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.

198. Directed Group Study (1-5) I, II, III, The Staff (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, The Staff (Kosuge in charge) (P/NP grading only.)

Graduate Courses

206A-206B. Diseases of Crop Plants (5-4) III-(Extra Session—Summer) The Staff (Ogawa in charge)
Lecture—3-1 hours; laboratory—6-9 hours. Prerequisite: course 120; Botany 119. A clinical study of plant diseases with emphasis on etiology, epidemiology, diagnosis, and control. (Deferred grading only, pending completion of sequence.)

208. Ecology of Plant Pathogens and Epidemiology of Plant Disease (3) II, Duniway
Lecture—3 hours. Prerequisite: course 120 or 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, DeVay, Kosuge
Lecture—3 hours; discussion—1 hour. Prerequisite: course 130 or 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 (2) I, Grogan; II, DeVay; III, Webster
Lecture—1 hour; discussion—1 hour. Prerequisite: consent of instructors. A study of the factors influencing pathogenicity and development of disease in plants. Different topics will be presented each quarter.

290. Seminar (1) I, Lear; II, Strand; III, Gilchrist
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, Shepherd; III, Campbell
Seminar—1 hour. Prerequisite: course 226. Review and evaluation of current literature and research in virology. (S/U grading only.)

Plant Physiology; Plant Science

295. Seminar in Mycology (1) I, Butler, III, Wells (Botany) 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 (1-4) I, II, III. The Staff (Kosuge in charge)

299. Research (1-12) I, II, III. The Staff (Kosuge in charge) (S/U grading only.)

Plant Physiology (A Graduate Group)

(College of Agricultural and Environmental Sciences)

Harry C. Kohl, Jr., Ph.D., Chairperson of the Group

Group Office, Environmental Horticulture Building

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. H. C. Kohl.

COURSES IN PLANT PHYSIOLOGY

Graduate Courses

298. Group Study (1-5) I, II, III. The Staff (Kohl 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 (Kohl in charge) Prerequisite: graduate standing. (S/U grading only.)

Plant Science

(College of Agricultural and Environmental Sciences)

Faculty

Floyd M. Ashton, Ph.D., Professor (*Botany*)

Emanuel Epstein, Ph.D., Professor (*Land, Air and Water Resources*)

William J. Flocker, Ph.D., Professor (*Vegetable Crops*)

Paul E. Hansche, Ph.D., Professor (*Genetics*)

Hudson T. Hartmann, Ph.D., Professor (*Pomology*)

Frederick D. Howard, Ph.D., Lecturer (*Vegetable Crops*)

Subodh K. Jain, Ph.D., Professor (*Agronomy and Range Science*)

Paulden F. Knowles, Ph.D., Professor (*Agronomy and Range Science*)

Lloyd A. Lider, Ph.D., Professor (*Viticulture and Enology*)

Robert S. Loomis, Ph.D., Professor (*Agronomy and Range Science*)

Leonard L. Morris, Ph.D., Professor (*Vegetable Crops*)

Klayton E. Nelson, Ph.D., Professor (*Viticulture and Enology*)

Harlan K. Pratt, Ph.D., Professor (*Vegetable Crops*)

D. W. Rains, Ph.D., Associate Professor (*Agronomy and Range Science*)

Lawrence Rappaport, Ph.D., Professor (*Vegetable Crops*)

Roy M. Sachs, Ph.D., Professor (*Environmental Horticulture*)

The Major Program

The objective of the Plant Science major is to train students in the biological and physical sciences as applicable to the technology required for the production and maintenance of plants. You may specialize in agronomy, floriculture, landscape horticulture, nursery management, plant pathology, crop protection, pomology, vegetable crops, or viticulture, or prepare for graduate work in the plant sciences. Occupational opportunities exist in nursery and greenhouse management, farming, technical and sales positions in agricultural business and associated enterprises (such as equipment and supply companies), as well as in private, state, and federal service in consulting or research.

Plant 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. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	36
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Mathematics (statistics)	4
Physics (Physics 1A and 1B)	6
Depth Subject Matter	38-39
Plant science (Plant Science 1, 2)	7
Soil science (Soil Science 2)	4
Water science (Water Science 2 or 110A)	3-4
Entomology (Entomology 110 or 112)	4
Nematology and/or weed science	4
Genetics (Genetics 100A, 100B)	6
Plant pathology (Plant Pathology 120)	4
Plant physiology (Botany 111A, 111B)	6
Breadth Subject Matter	20
Written expression (English 1, 2, or 5F)	4
Oral expression (Rhetoric 1 or 3)	4
Social sciences and humanities electives†	12
Restricted Electives	45

Courses supportive of the major in the agricultural and natural sciences and in economics and agricultural economics, *selected with the advisers approval*. Should include at least three courses in the area of specialization or closely related field.

Specialization may be taken in: agronomy, floriculture, landscape horticulture, nursery management, plant pathology, 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 requirement.

Unrestricted Electives 40-41

Total Units for the Major 180

Major Adviser. W. C. Weir.

Related Courses. See Agronomy, Environmental Horticulture, Plant Pathology, Pomology, Vegetable Crops, Viticulture and Enology.

COURSES IN PLANT SCIENCE

Questions pertaining to the following courses should be directed to the instructor or to the College Office, 228 Mrak Hall.

Lower Division Courses

1. Plants and Man (3) I, II. Howard

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. Flocker, Lider
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.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Group study of selected topics. Restricted to lower division students. (PNP grading only.)

Upper Division Courses

101. Ecology of Crop Systems (4) II. Loomis, Rains

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, Rappaport

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.

109. Principles of Plant Propagation (3) III. Hartmann, Kester

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, Nelson

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, Nelson
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 (3) II. Knowles, Hansche
Lecture—3 hours. Prerequisite: Genetics 100B. The principles of plant breeding.

116. Mineral Nutrition of Plants (4) III. Epstein
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.

120. Introduction to Weed Science (2) II. Ashton
Lecture—2 hours. Prerequisite: Botany 2; Chemistry 8B. A general course covering the principles underlying the control of weeds.

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. (Same course as 221A-221B-221C.)

190. Proseminar in Plant Science (1) III. The Staff (Howard in charge)
Seminar—1 hour. Prerequisite: senior standing in Plant Science or consent of instructor. Reports and discussion of current developments in plant science and crop production. (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.)

Graduate Course

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. (Same course as 121A-121B-121C.)

Political Science

(College of Letters and Science)

Edmond Costantini, Ph.D., Chairperson of the Department
Department Office, 228 Voorhies Hall

Faculty

Edmond Costantini, Ph.D., Professor
George W. Downs, Jr., Ph.D., Assistant Professor
Philip L. Dubois, M.A., Acting 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
Robert J. Lieber, Ph.D., Associate Professor
Lloyd D. Musolf, Ph.D., Professor
John R. Owens, Ph.D., Professor

NOTE: For key to footnote symbols, see page 132.

Kenneth A. Oye, A.B., Acting Assistant Professor
Larry I. Peterman, Ph.D., Associate Professor
Dale Rogers Marshall, Ph.D., Professor
Adaljiza S. Riddell, Ph.D., Assistant 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*)
Marvin 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 study of Political Science is valuable not only in providing students with a better understanding of politics in general and of the political systems in which they live, but also as a first step toward careers in teaching, higher education, law, state and local government, urban planning, the federal bureaucracy, journalism, politics, and administration.

The Political Science—Public Service major is designed for students who have an interest in careers or other activities in public service. 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 several quarters of a 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 the areas of American government (politics, state and local government, public policy), public administration, environmental politics, and public law. Courses taken in other departments—Economics, Environmental Studies, Environmental Planning and Management—can 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, 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 of concentration (shown below) from two of the following three groups	24
Group A	
(1) Political theory, Political Science 110-119	
Group B	
(2) American Government, Political Science 100-109B, 170, 171, 191	
(3) Political parties, Political Science 160-169	

(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
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
Depth Subject Matter	48
Core Program	8
One course from Political Science 100, 101, 102, 104; and one course from Political Science 109A, 180, 182	
Internship	12
Political Science 190A, 190B, 190C	
Fields of Concentration	28
Select seven upper division courses from two or three fields of concentration listed below with at least two courses in each field selected; at least 20 of the units must be in Political Science. (Core Program courses do not count toward this requirement.)	
Total Units for the Major	60

Fields of Concentration

1. Politics: Political Science 103, 104, 105, 106, 109A-109B, 160, 162, 163, 164, 165, 166, 167, 168, 169, 171.
2. Administration: Political Science 156, 180, 181, 182, 183, 186, 187, 188, 189; Economics 131.
3. Urban affairs: Political Science 100, 101, 102, 191; Economics 125A, 125B; Environmental Planning and Management 110; Environmental Studies 173, 162.
4. Environmental quality control: Political Science 107, 108; Economics 123; Environmental Studies 144, 160, 161, 166, 168A, 168B.
5. Public/Pre-Law: Political Science 151, 152, 156, 157A, 157B, 159.

Major Advisers. Consult Departmental Office.

Teacher Credential Subject Representative. Consult Departmental Office. See page 107 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, 109A, 109B, 113, 127, 128, 160, 163. (See also page 60.)

COURSES IN POLITICAL SCIENCE

Lower Division Courses

1. American National Government (4) I, III. 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) I, II. 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, Lieber; III, Siverson 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. Siverson, 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, 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.

9. Introduction to Contemporary Problems of Asia (4) I, 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.

Upper Division Courses

100. Local Government and Politics (4) I, 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, counties, and special districts. Emphasizes sources and varieties of community conflict, legislative and executive patterns, expertise, decision making, and the politics of structure. Observation of local governing boards.

101. Urban Political Economy (4) II 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) I, 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) III. The Staff 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, Wandesforde-Smith Lecture—3 hours; discussion—1 hour. Introduction to the environment as a political issue in the United States and to the development of administrative mechanisms for handling environmental problems. Changing role of Congress, the presidency, the bureaucracy, and the courts in environmental policy formulation and implementation.

***108. Agricultural Policy and Politics** (4) I, 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.

109A. Public Policy and the Governmental Process (4) I, Downs Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Examination of the processes of formulating public policy. Methods of policy making by executive, legislative, judicial, interest groups, and parties with special emphasis upon socio-psychological approaches.

109B. Public Policy and the Governmental Process (4) II. Wade Lecture—3 hours; term paper. Prerequisite: course 5,

109A, or consent of instructor. Examination of the processes of formulating public policy. Methods of policy making through collective decision-making exchange, competition, bargaining, coalition-formation and the provision of public goods, resource transfers and social change.

***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) III. 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) 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.

***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. 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. Zetterbaum 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) I, 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 Organization** (4) I.

Lecture—3 hours; discussion—1 hour. The preservation of world peace through collective security arrangements. Analysis of the conditions under which international organizations can or cannot preserve peace, through examination of the record of the United Nations, League of Nations, and more restricted security organizations.

***125. National Security Policy** (4) II. Siverson

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) III.

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, Oye

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. Oye

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) II. Zinner

Lecture—3 hours; discussion—1 hour. The conduct of Soviet foreign relations in contemporary world affairs; ideology and power as mainstays 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.

***134. International Relations in Africa** (4) III. 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. Colonialism Neocolonialism and Nationalism in Africa** (4) I, Rothchild

Lecture—4 hours. Analysis of colonial penetration; European political, social, economic, and administrative impact on African societies; the rise of African nationalism; and the continuing effect of the colonial relationship upon present-day Euro-African contacts.

***139. International Relations in Western Europe** (4) II. Lieber

Lecture—4 hours. Study of the emerging unity in Western Europe and its implications for the North Atlantic area. Offered in even-numbered years.

140A. Comparative Politics: Ideology, Institutions and Political Process in the Modern State (4) II. Groth

Lecture—3 hours. Prerequisite: consent of instructor.

Ideological orientations of democratic, socialist, communist, fascist and other states as related to their institutions and political processes.

***140B. Comparative Politics: Political Systems and Public Policies** (4) II. Groth

Seminar—3 hours; special assignments. Prerequisite: course 140A or consent of instructor. Critical evaluation of the linkage between the framework and process of policy-making on the one hand, and the actual results of this process on the other; a comparative, cross-national perspective will be employed.

141. Communist Political Systems (4) I, 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, facism, and nationalism.

143. Latin American Politics (4) II. Riddell

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) II. 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) II. Groth

Lecture—4 hours. The evolution, politics, and contemporary problems of selected political systems of Western Europe.

148A. Government and Politics in East Asia—China (4) II. Kallgren

Lecture—4 hours. The evolution of political institutions in China including problems of nationalism, political modernization, ideology and political models of economic development. Emphasis is on contemporary China.

148B. Government and Politics in East Asia—Japan and Korea (4) III. Kallgren

Lecture—4 hours. The evolution of political institutions in Japan and Korea including problems of nationalism, political modernization, ideology and political models of economic development. Emphasis is on contemporary Japan and Korea.

149. International Communism (4) III. 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) III.

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) II. 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.

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; natural law and economic regulation; law and the frontier. Offered in odd-numbered years.

159. Judicial Behavior (4) I. 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) I, The Staff

Lecture—3 hours; discussion—1 hour. Organization, operation, governmental function and social bases of political parties especially in Great Britain and France but with some reference to other Western European countries.

***162. Elections and Voting Behavior** (4) III. 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) II. The Staff

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

NOTE: For key to footnote symbols, see page 132.

Political Science

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. Riddell

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) III. 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. Government and Economy (4) III. 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.

171. Community Power and Change (4) I, Riddell

Lecture—3 hours; discussion—1 hour. Examination of the relationships between general community characteristics, the distribution of political power, and policy outputs in the United States. Alternative models of community political change are presented. Offered in odd-numbered years.

*174. Political Thinking and Consciousness (4) III.

Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. How and why people think about phenomena as political, and what society does in order to shape that thinking and make "good citizens." The emphasis is on how social conditions influence political thinking and behavior; cases will be taken from the politics of minority groups, American youth, radical groups, attempts at achieving cultural revolutions.

*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; so-

cial 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) II.

Lecture—3 hours; special assignments. Approaches to and models of administrative decision making; techniques of substantive policy analysis; problems and developments in planning, budgeting, personnel, and administrative reform.

183. Administrative Behavior (4) II. 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) III

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) III. 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.

190A. Internship in Public Affairs (4) I, II, III. The Staff

Prerequisite: enrollment dependent on availability of intern positions, with priority to students with Political Science—Public Service major. Supervised internship and study in political, governmental, or related organizations. (P/NP grading only)

190B. Internship in Public Affairs (4) I, II, III. The Staff Prerequisite: enrollment dependent on availability of intern positions, with priority to students with Political Science—Public Service major. Supervised internship and study in political, governmental, or related organizations. Not to be taken concurrently with 190A. (P/NP grading only.)

190C. Internship in Public Affairs (4) I, II, III. The Staff

Prerequisite: required of and open only to students with Political Science—Public Service major; courses 190A and 190B (may be taken concurrently). Supervised internship and study in political, governmental, or related organizations. Extensive paper relating internship to course work. (P/NP grading only.)

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.

192A-192B. International Relations (4-4) II-III. Oye

Seminar—4 hours. Prerequisite: consent of instructor. Selected problems of international relations evaluated in an interdisciplinary context. Readings, discussion, papers. Required of all international relations majors in their senior year.

*194H. Special Study for Honors Students (1-5) I, II, III.

Directed reading, research, and writing. Prerequisite: selection of candidates by Department. Program of research, culminating in writing of a senior honors thesis, under direction of a faculty adviser. (P/NP grading deferred until completion of a 3-quarter 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) II. 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) III.

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) III. 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. Wandesforde-Smith

Seminar—4 hours. Analysis of the interface between the world of academic reflection about ecological and environmental problems and the world of political action. Evaluation of alternative approaches to policy analysis and recommendation. Individual research, including field research, will parallel discussion of the literature.

208. Policy Analysis (4) III. Downs

Seminar—4 hours. Social science techniques applied to public policy formation and evaluation.

209. The American Political System (4) II. 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) III. 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) I.
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) I, 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.

***261. Political Behavior** (4) III. Owens
Seminar—3 hours.

264. Seminar in Public Opinion (4) II. Costantini
Seminar—3 hours.

***270. National and Regional Integration** (4) I, Rothchild
Lecture—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.

***286. Administrative Values** (4) I, 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 (1-4) 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. Directed Reading (1-6) 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
Department Office, 1035 Wickson Hall (752-0122)

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
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
Hudson T. Hartmann, Ph.D., Professor
Claron O. Hesse, Ph.D., Professor
Dale E. Kester, Ph.D., Professor
John M. Lavavitch, Ph.D., Lecturer
Joseph W. Y. Lin, Ph.D., Assistant Professor
George C. Martin, Ph.D., Lecturer
F. Gordon Mitchell, M.S., Lecturer
E. Louis Proebsting, Ph.D., Professor Emeritus
David E. Ramos, Ph.D., Lecturer
Roger J. Romani, Ph.D., Professor
Kay Ryugo, Ph.D., Lecturer
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 112, 112L.

COURSES IN POMOLOGY

Lower Division Courses

3. Citrus and Other Subtropical Fruits (3) II. Bringham
Lecture—3 hours (including one 3-hour fieldtrip 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 Production and Utilization (3) I, Martin, Sommer
Lecture—2 hours; discussion—1 hour. Introduction to pomology including: origin and climatic adaptation of deciduous fruits; orchard planning and management; agricultural chemicals; tree nutrition; insect and disease control; fruit development, maturation and harvesting; quality control, storage, transportation and marketing; dietary significance.

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: Flowering, Fertilization, and Harvesting (4) III. Ryugo
Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 2 or Plant Science 102 or consent of instructor. Growing and harvesting of edible fruits; the nature and development of buds, flowers, and fruits, with emphasis on commercial deciduous species.

NOTE: For key to footnote symbols, see page 132.

Preforestry; Psychology

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 physiological phenomena of growth, maturation, ripening, and senescence of fruit. (Open to qualified undergraduates.)

210. Fruit Morphology (4) II. Lin
Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2. The development of flower, fruit, and seed structures of representative fruit types.

290. Seminar (1) I, II, III. The Staff (Catlin in charge)
Seminar—1 hour.

298. Group Study (1-5) I, II, III. The Staff (Sommer in charge)

299. Research (1-9) 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 110.)

Preforestry Advisers. E. H. Stanford (*Agronomy and Range Science*), J. Major (*Botany*).

Psychiatry

See Medicine

Psychology

(College of Letters and Science)

Neal E. A. Kroll, Ph.D., Chairperson of the Department
Department Office, 149 Young Hall

Faculty

Linda P. Acredolo, Ph.D., Assistant Professor
Jarvis R. Bastian, Ph.D., Associate Professor
Leo M. Chalupa, Ph.D., Assistant Professor
Stanley Coopersmith, Ph.D., Associate Professor
Richard G. Coss, Ph.D., Assistant Professor
William F. Dukes, Ph.D., Professor Emeritus
Alan C. Elms, Ph.D., Associate Professor
Marina E. Estabrook, M.A., Associate in Psychology
Albert A. Harrison, Ph.D., Associate Professor
*Kenneth R. Henry, Ph.D., Associate Professor
Carl C. Jorgensen, Ph.D., Assistant Professor
(*Psychology, Sociology*)
Thomas W. Klein, Ph.D., Assistant Professor
Neal E. A. Kroll, Ph.D., Associate Professor
Dale F. Lott, Ph.D., Associate Professor (*Wildlife and Fisheries Biology*)
Joseph Lyons, Ph.D., Professor
William A. Mason, Ph.D., Professor
Gary D. Mitchell, Ph.D., Professor
Robert M. Murphey, Ph.D., Associate Professor
Thomas Natsoulas, Ph.D., Professor
Donald H. Owings, Ph.D., Assistant Professor
Karen E. Paige, Ph.D., Associate Professor
Theodore E. Parks, Ph.D., Associate Professor
Dean K. Simonton, Ph.D., Assistant Professor
Robert Sommer, Ph.D., Professor
Charles T. Tart, Ph.D., Professor
Edward D. Tumer, Ph.D., Associate Professor

The Major Programs

This major is intended to acquaint the student with the enormous field of contemporary psychology. Although the courses reflect a wide array of approaches, interests, and issues, emphasis is upon the application of the tools of science to uncover the biological, environmental, and social causes and consequences of behavior. The Bachelor of Arts program is geared for the student interested in liberal arts; the Bachelor of Science program is geared for students with a keen interest in mathematics or biology. The program acquaints the student with the basic terms, procedures and principles of contemporary psychology, but does not constitute preparation for employment as a professional psychologist. Counseling and other careers in psychology require graduate-level training.

Psychology

A.B. Requirements:

	UNITS
Preparatory Subject Matter	17-21
Psychology 1	4
Mathematics 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 Mathematics 13 and Psychology 41	
Depth Subject Matter	40
Two courses from two of the following three groups and one course from the remaining group	20-23
Group A: Psychology 130, 131, 132A, 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	17-20
Total units for the Major	57-61

Psychology

B.S. Requirements:

	UNITS
Preparatory Subject Matter	47-52
Psychology 1	4
Mathematics 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	15
Chemistry 1A, 1B	10
One course in sociology or cultural anthropology (may be lower or upper division)	4-5
Depth Subject Matter	48-51
Seven Psychology courses distributed as specified:	
Group A. Two courses from 130, 131, 132A, 135 ..	7-8
Group B. Three courses from 108, 129, 134, 150 ..	15
Group C. Two courses from 112, 145, 147, 168 ..	8-10
Additional units to achieve a total of 40 upper division units in psychology	7-10
Genetics 100A, 100B; or 115	5-6
Zoology 125 or 148	3-5
Total Units for the Major (Biology Emphasis)	95-103

Recommended

Psychology 41, 154, 180B, 180K, and 199 (in a psychobiological topic); Zoology 105, 106; Anthropology 154, Environmental Studies 110.

Mathematics Emphasis

	UNITS
Preparatory Subject Matter	40-46
Psychology 1	4
Mathematics 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, 132A, 135 . . .	7-8
Group B. Two courses from 108, 129, 134, 150 . . .	10
Group C. One course from 112, 145, 147, 168 . . .	4-5
Psychology 103	5
One course from Psychology 107, 206, 207 . . .	4
Additional units to achieve a total of 40 upper division units in psychology	8-10
One course sequence from Mathematics 105A-105B, 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. Mathematics 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, S. Coopersmith, R. G. Coss, A. C. Elms, A. A. Harrison, K. R. Henry, C. C. Jorgensen, T. W. Klein, N. E. A. Kroll, J. Lyons, W. A. Mason, G. D. Mitchell, R. M. Murphey, T. Natsoulas, D. H. Owings, K. E. Paige, T. E. Parks, D. K. Simonton, R. Sommer, C. T. Tart, 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 (see page 97) and complete Psychology 194H, which is normally taken in the senior year and which includes an honors thesis.

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D. degrees 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. (PNP 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. (PNP grading only.)

Upper Division Courses

103. Advanced Quantitative Description of Behavior (5) I, Kroll, Turner
Lecture—5 hours. Prerequisite: Mathematics 13 or consent of instructor. Summary, inference, and prediction from psychological data, with emphasis on the theoretical aspects.

107. Psychometric Methods (4) III. Simonton
Lecture—4 hours. Prerequisite: course 103 or consent of instructor. General principles of psychological measurement; psychophysical methods; scale, and correlational techniques in psychological measurement; reliability, validity.

108. Physiological Psychology (5) I, II, III. Chalupa, Henry
Lecture—5 hours. Prerequisite: course 1; at least one zoology or physiology course or consent of instructor. Influences of neuroanatomy and physiology on emotion, motivation, states of consciousness, language, learning, and memory in man and other animals.

112. Developmental Psychology (4) I, II, III. Coopersmith, Coss, Mitchell, Acredolo
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) II. 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) III. Bastian
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, Owings
Lecture—5 hours Prerequisite: course 1 or Zoology 2 or consent of instructor. Psychobiology of sensory systems in man and other animals. The relationship of behavior to the physiology, structure and function of the senses.

130. Human Learning and Memory (4) I, II, III. Kroll, Parks
Lecture—4 hours. Prerequisite: course 1 and Mathematics 13; or consent of instructor. Consideration of major theories of human learning and memory with critical examination of relevant experimental data.

131. Perception (4) II, III. Natsoulas, Turner
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.

132A. Language and Cognition (3) I. Bastian
Lecture—3 hours Prerequisite course 1 and 6 units of upper division work in psychology or linguistics. Linguistic actions in zoological, social, and individual perspectives; the processes underlying speech production and perception and their development in children.

132B. Language and Cognition (3) II. Bastian
Lecture—3 hours. Prerequisite course 132A. A developmental examination of the reference and meaning of linguistic actions, their cognitive significance, and their consequences in human conduct, enculturation, and education.

134. Animal Learning and Motivation (5) III. Coss
Lecture—5 hours. Prerequisite: courses 1 or 15 or consent of instructor. General theories of phyletic differences in

learning and motivation drawing upon data from laboratory and field observations. Innate physiological mechanisms, developmental changes, effects of conditioning and other constraints on these processes are examined.

135. Psychology of Consciousness (4) I, III. Natsoulas
Lecture—3 hours; term paper. 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) II, 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

144. Environmental Awareness (4) I, II, III. Sommer, Coss
Lecture—3 hours; discussion—1 hour. Interactions of people with manmade 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 course 170 (Same course as Environmental Studies 144.)

145. Social Psychology (4) I, II, III. Harrison, Jorgensen, Turner, 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

***146. Psychology in Social Issues** (4) III Jorgensen
Lecture—3 hours; discussion—1 hour Prerequisite: course 145. Intellectual, political and economic roots of psychological research concerned with public issues or social change.

147. Personality Theory (5) I, II, III. Elms, Paige
Lecture—4 hours; independent library work. Prerequisite course 1 and 6 units upper division work in psychology A systematic consideration of contemporary theories of personality.

148. Interpersonal Relations (4) II, III Jorgensen
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) II, III. Paige
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
Lecture—4 hours; discussion or project—1 hour. Prerequisite: course 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.

151. Behavioral Genetics (4) III Klein
Lecture—4 hours An introduction to the application of the methods of genetic analysis to the study of behavioral traits in humans and animals. Basic genetic principles, single-gene analysis, population genetics, and evolution, as they relate to behavior, will be considered.

154. Primate Psychology (4) III. Mitchell
Lecture—4 hours. Prerequisite: course 150 or consent of instructor. A comparative survey of primarily laboratory experimentation on learning, communication, cognition, sensation, motivation, emotion, perception, and the effects of early experience in many species of primates

157. Personality Assessment (4) II. Klein
Lecture—4 hours. Prerequisite course 147; Mathematics

NOTE: For key to footnote symbols, see page 132.

Radiological Sciences

13 or the equivalent. An exploration and evaluation of the principal methods in personality assessment, measurement and research

159. Social Psychology of Black Americans (5) II, III Jorgensen, 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, III Lyons
Lecture—4 hours Prerequisite course 165 or 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 165 or the equivalent and consent of instructor Survey, including lectures and demonstrations, of humanistic, existential, or "third-force" movements in contemporary psychology. Theory, data, and techniques in the work of Maslow, Rogers, and others who emphasize creativity and self-actualization

171. Humanistic Psychology (4) I, Lyons, Tart
Lecture—4 hours Prerequisite course 165 or the equivalent and consent of instructor Survey, including lectures and demonstrations, of humanistic, existential, or "third-force" movements in contemporary psychology. Theory, data, and techniques in the work of Maslow, Rogers, and others who emphasize creativity and self-actualization

180A-K. Experimental Psychology (4) 180C: I, III; 180K: II, 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 A, B, D, E, F, G, H, I, and J are not offered 1976-77)

181A-181B. 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)

190. Seminar in Psychology (4) I, II, 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

194H. Special Study for Honors Students (1-5) I, II, III The Staff

Prerequisite 20 units in psychology and honors status; consent of Department Chairperson Independent investigation of an empirical problem. Course required for highest honors in Psychology. (P/NP grading only)

***196. Advanced General Psychology (4) II, III. Murphey**
Lecture—4 hours Prerequisite 18 units upper division work in psychology Exploration of the present status of systematic psychology. An integrative treatment of the major areas, problems, and methodologies

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)

By prior arrangement with individual 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)

206. Statistical Analysis of Psychological Experiments (4) II Klein, 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. Statistical Inference from Psychological Experiments (4) II Turner, Kroll

Lecture—4 hours Prerequisite course 103 or consent of instructor The relationships between statistical models and inferences about empirical processes, with an emphasis on distribution-free models

***208. Physiological Psychology (4) II 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) I Acredolo
Seminar—4 hours Prerequisite graduate standing in psychology or consent of instructor The original behavioral repertoire of the child and its subsequent development

***229. Sensory Processes (4) II 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) III 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) II Harnson
Seminar—4 hours Prerequisite graduate standing in psychology or consent of instructor Theory and research in social psychology

247. Personality (4) I, Elms, Paige
Seminar—4 hours Prerequisite graduate standing in psychology or consent of instructor Theory and research in human personality

***250. Comparative Psychology (4) III 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) I Klein 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) I Chalupa

Seminar—4 hours

263A-263B-263C. Topics in Cognitive Psychology (4) I,

Bastian, Kroll, Parks
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) III Bastian

Seminar—4 hours

*272. Experimental Study of Personality (4) II

Coopersmith
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) I, 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) II, 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 (1-4) I, II, III The Staff
(S/U grading only)

299. Research (2-9) I, II, III The Staff
(S/U grading only)

299D. Dissertation Research (1-9) 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,

II, III The Staff
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)

Joe P. Morgan, D.V.M., Vet. med. dr., Chairperson of the Department

Department Office, Temporary Building 173, Room 100

Faculty

Norman Ackerman, D.V.M., Assistant Professor
Steven Book, Ph.D., Lecturer (*Radiobiology Laboratory*)

Gerald L. DeNardo, M.D., Professor (*School of Medicine*)

Marvin Goldman, Ph.D., Professor (*Radiobiology Laboratory*)

Joe P. Morgan, D.V.M., Vet. med. dr., Professor
Timothy R. O'Brien, D.V.M., Ph.D., Associate Professor

Philip E. S. Palmer, M.D., Professor (School of Medicine)
 Sam Silverman, D.V.M., Lecturer
 Peter F. Suter, Dr. med. vet., Professor

COURSES IN RADIOLOGICAL SCIENCES

Upper Division Courses

180. Bioenvironmental Consequences of Nuclear Technology (3) III. Goldman

Lecture—1½ hours; discussion—½ hour; term paper; field trip to Nuclear Power Station. Prerequisite: Physics 2A and the Biological Sciences 1 or and 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. Morgan 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. Morgan 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. Morgan 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. Morgan 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 relationships, radiation therapy, environmental radioactivity, and radiation-protection criteria.

298. Group Study (1-5) I, II, III. Radiology Staff
 (S/U grading only.)

299. Research (1-9) 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. In addition, the training provided by this major should provide 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. Equal 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 (Mathematics 13, 16A)	7
Economics (Economics 1A or Agricultural Economics 1)	4-5
Production of cultivated plants (Plant Science 2)	4
Depth Subject Matter	65-71
Plant Science 102	4
Physical geography (Geography 1) or Geology (Geology 1)	3-4
Meteorology (Atmospheric Science 20 or Agricultural Engineering Technology 111)	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 or Wildlife and Fisheries Biology 108	4
Resource sciences (Resource Sciences 100)	4
Plant ecology (Plant Science 101 or Botany 117)	3-4
Wildlife ecology (Wildlife and Fisheries Biology 135, 151 or Entomology 104)	3-4
Animal physiology, zoology or botany	6
Range Management 1, 100, 105, 133, 142, 150, 198, 199	18
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, geography, or political science	12
Unrestricted Electives	32-39
Total Units for the Major	180

Major Adviser. C. A. Raguse.

Graduate Study. See page 101.

NOTE: For key to footnote symbols, see page 132.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement

Range Management

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Agronomy and Range Science.

Major Program. See the major in 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, Resource Sciences 100, Soil Science 105, 120, 121, Wildlife and Fisheries Biology 108, 135, 151.

COURSES IN RANGE MANAGEMENT

Questions pertaining to the following courses should be directed to the instructor or to the College Office, 228 Mrak Hall.

Lower Division Course

1. Introduction to Range Management (4) II. 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.

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. Love, 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.

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.

150. Principles and Procedures in Sampling Herbaceous Rangeland Vegetation

(2) III. Raguse
Lecture—1 hour; laboratory—3 hours; one Saturday field trip. Prerequisite: course 100 and 142; Mathematics 13 or Agricultural Science and Management 150 or consent of instructor. Principles and methods used in sampling herbaceous grasslands vegetation. Techniques and tools used to estimate cover, frequency, density and weight. Exercises in data collection and statistical analysis using artificial and field populations. Applicability of remote sensing.

198. Directed Group Study (1-5) I, II, III. The Staff (Love in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Love 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, Phillips; III, Rowell
Seminar—1-2 hours. Topics of current interest in grassland ecology, range and wildlands management, and related modeling and systems analysis.

298. Group Study (1-5) I, II, III. The Staff (Love in charge)
Selected topics from current world literature in range science.

299. Research (1-12) I, II, III. The Staff (Knowles 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)

Program Office, 4208 Storer Hall

Committee in Charge

Paul A. Castelfranco, Ph.D. (*Botany*), Committee Chairperson
Ronald J. Baskin, Ph.D. (*Zoology*)
Robert O. Crummey, Ph.D. (*History*)
Richard T. Curley, Ph.D. (*Anthropology*)
Manfred P. Fleischer, Ph.D. (*History*)
R. David Freedman, Ph.D. (*Religious Studies*)

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 spokesman 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	18
History 4A, 4B, 9A	12
Philosophy 21	4
Religious Studies 10	2
Depth Subject Matter	42-44
Religious Studies 190, 193	6-8

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, Religious Studies 150, Sociology 146)

Total Units for the Major 60-62

Recommended

American Studies 1B; Anthropology 2; Classics 10, 41, Integrated Studies 2B; Philosophy 6, 15. A reading knowledge of a foreign language is highly recommended. Consult major adviser for a complete list of recommended upper division courses.

Major Adviser. P. A. Castelfranco.

Hebrew Courses. See Religious Studies 30A-30B-30C, 32A, 32B, and 35A-35B.

COURSES IN RELIGIOUS STUDIES

Lower Division Courses

4A. World Religions (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Eastern religions, including Hinduism, Buddhism and Taoism from their origins to the present.

4B. World Religions (4) I. 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. Reading and discussion of basic texts from at least two major religious traditions.

21. Biblical Narrative (4) I, Freedman
Lecture—3 hours; term paper. The Torah (Pentateuch) narratives will be analyzed with regard to the religious ideas and ideals explicit and implicit in them. Offered even-numbered years.

22. Biblical Law (4) I, II. Freedman
Lecture—3 hours; term paper. Analysis of the religious and social ideals of laws in the Torah (Pentateuch) with special emphasis on laws currently in force among Jews.

23. Rabbinic Judaism (4) II, III. Freedman
Lecture—3 hours; term paper. Prerequisite: course 22

recommended Rabbinic Judaism from its Pharisaic origins at the beginning of the Christian Era through its classical expressions in the Middle Ages. The contribution of various types of Rabbinic thought (mystical, philosophical, legal) to the development of Jewish civilization.

24. Modern Judaism (4) III. Freedman
Lecture—3 hours; term paper. Prerequisite: course 23. The confrontation of the millenia-old Jewish civilization with emancipation, enlightenment, modernity, modern anti-Semitism, and ecumenism: development of traditional and non-traditional responses. Offered in even-numbered years.

30A-30B-30C. Elementary Modern Hebrew (5-5-5) I, II, III. The Staff (Chairperson in charge)
Lecture—4 hours; laboratory—2 hours. Introduction to modern written and spoken Hebrew. Course 30A not open for credit to students who have completed the first two years of high school Hebrew.

31ATA. Individualized Elementary Hebrew (5) I, II, III. The Staff (Chairperson in charge)
Laboratory—8 hours; conference—1 hour. Introduction to modern written and spoken Hebrew. Parallels material of course 30A. Individualized instruction by videotape.

31ATB. Individualized Elementary Hebrew (5) I, II, III. The Staff (Chairperson in charge)
Laboratory—8 hours; conference—1 hour. Prerequisite: course 30A and 31ATA, or consent of instructor. Introduction to modern written and spoken Hebrew. Parallels material of course 30B. Individualized instruction by videotape.

32A. Intermediate Modern Hebrew (4) I, Freedman
Lecture—1 hour; discussion—3 hours. Prerequisite: course 30C or the equivalent. Review of grammatical principles by means of written exercises; readings of modern texts.

32B. Intermediate Modern Hebrew (4) II. Freedman
Lecture—1 hour; discussion—3 hours. Prerequisite: course 32A; course 24 recommended. Continuation of course 32A. The 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) I-II. Freedman
Lecture—2 hours; discussion—2 hours. The grammar and syntax of Biblical Hebrew; the goal is to achieve the ability to read Biblical prose.

40. New Testament (4) III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. The study of New Testament literature from critical, historical and religious perspectives.

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

***102. Christian Origins** (4) I, The Staff (Chairperson in charge)
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) III. 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) I, Freedman
Lecture—3 hours; term paper. Prerequisite: course 21 or

22. Study of a book from the Prophets or Writings from critical, historical, and religious perspectives.

123. Rabbinic Texts (4) III. Freedman
Lecture—4 hours. Prerequisite: course 23. Examination of Rabbinic texts from the period of the Talmud from critical, historical, and religious perspectives. Texts will be studied in English.

124. Topics in Judaism (4) III. Freedman
Lecture—3 hours; term paper. Prerequisite: course 23. Examination of selected aspects of Jewish life, religion, or literature.

140. Christian Theology (4) I, Castelfranco
Lecture-discussion—3 hours; term paper. Prerequisite: course 40; course 4B recommended. Christian dogmas, their scriptural basis and their implication for the life of the church and of the individual believer. Offered in even-numbered years.

150. Topics in Judaic-Christian Ethics (4) I, The Staff (Chairperson in charge)
Lecture—4 hours. An examination of contemporary ethical issues from the standpoint of the Bible and the teachings of major Jewish and Christian communions.

168. The Religions of India (4) I, The Staff (Chairperson in charge)
Lecture-discussion—3 hours; term paper. Prerequisite: either course 4A or 10 recommended. The classical religions of India including early Buddhism.

170. Chinese and Japanese Buddhism (4) II. The Staff (Chairperson in charge)
Lecture-discussion—3 hours; term paper. Prerequisite: course 4A recommended. Lectures, readings and discussion on the development of Buddhism in China and Japan; its influence on various Far Eastern art forms.

172. Ch'an (Zen) Buddhism (4) III. The Staff (Chairperson in charge)
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.

190. Senior Colloquium (2) I, The Staff (Chairperson in charge)
Seminar—2 hours. Prerequisite: open only to seniors in Religious Studies. Discussion of central issues of religion.

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 offers an opportunity for a general education relating to the

uses and management of natural resources, while providing maximum adaptability in meeting individual needs, interests, and objectives. The program serves particularly well for students who (a) possess significant but nonspecific interests in the natural resources of California and adjacent states; (b) are interested in careers and activities associated with resource utilization and management; (c) are contemplating a natural resources-related occupation but you are uncertain regarding the selection of a specific major; and (d) have an academic goal that involves acquisition of multiple interest capabilities not provided through traditional programs. All Renewable Natural Resources programs, regardless of emphasis, integrate the benefits of a "core" of essential social, physical, and biological sciences with the advantages of a large block of elective courses. Campus counseling and Work-Learn Center assistance complement adviser efforts to insure students maximum opportunity for personal development and professional satisfaction.

The major will prepare you for participation as an enlightened citizen in resource issues of public concern. Employment in general areas of natural resource use, education, and conservation is open to graduates. With appropriate electives, this major can provide preparation for graduate programs.

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. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	73
Biology (Biological Sciences 1)	5
Choose two courses from: Animal science (Animal Science 1, 2) and/or plant science (Plant Science 1, 2)	6
Additional courses in the biological sciences	14
English and/or rhetoric	8
Physics and chemistry	22
Mathematics (Mathematics 13)	9
Soil and/or water science	6
Geology or physical geography	3
Breadth Subject Matter	30
Biological, physical, environmental sciences electives	18
Social sciences and humanities electives†	12
Depth Subject Matter	7-8
Resource Sciences 100	4
Agriculture Economics 147 or 148	3-4
Restricted Electives	30
Resource-oriented courses, including at least one appropriate upper division course from three of the following areas: animal science, atmospheric science, botany, economics or agricultural economics, civil or agricultural engineering, environmental horticulture, environmental planning and management, environmental studies, environmental toxicology, geography, plant sciences, range management, resource sciences, soil and/or	

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

NOTE: For key to footnote symbols, see page 132.

Reproduction; Resource Sciences; Rhetoric

water science wildlife and fisheries biology, zoology, or others with concurrence of adviser

Unrestricted Electives 39-40

Total Units for the Major 180

Major Adviser. H. O. Walker (*Land, Air and Water Resources*).

Graduate Study. See page 101.

Reproduction

(School of Veterinary Medicine)

John W. Kendrick, D.V.M., Ph.D., Chairperson of the Department

Department Office, 2301 Haring Hall

Faculty

Donald L. Bath, Ph.D., Lecturer
Maarten Drost, D.V.M., Associate Professor
Andrew G. Hendrickx, Ph.D., Professor in Residence

John P. Hughes, D.V.M., Professor
John W. Kendrick, D.V.M., Ph.D., Professor
D. P. Neely, D.V.M., Acting Assistant Professor
Victor M. Shille, D.V.M., Lecturer
Ann T. Smith, Ph.D., Lecturer
George H. Stabenfeldt, D.V.M., Ph.D., Professor
Clyde Stormont, Jr., Ph.D., 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 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 (Kendrick 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

232. Teratologic Aspects of Development

(2) II Hendrickx
Lecture—2 hours Prerequisite courses in embryology, histology, and anatomy, or consent of instructor. Embryological and pharmacological principles of teratogenesis; design and interpretation of teratogenic tests; consideration of congenital malformations and abnormalities induced by environmental and genetic factors Offered in odd-numbered years

234. Applied Dairy Cattle Nutrition

(2) III Bath
Lecture—1 hour; laboratory—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 (Kendrick in charge)

299. (1-12) I, II, III The Staff (S.U. grading only)

Professional Courses

424. Theriogenology of Farm Animals

(1½ 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 the Department of Land, Air and Water Resources (Soils and Plant Nutrition Section).

Related Major Program. See the major in Renewable Natural Resources, page 287.

Related Courses. See Agricultural Economics 147, 148, 176, 283, Atmospheric Science 20, Environmental Planning and Management 1, Environmental Studies 10, 12, 100, Geography 3, 5, 161, Range Management 1, 105, Soil Science 2, 10, 105, Wildlife and Fisheries Biology 10, 151.

COURSES IN RESOURCE SCIENCES

Questions pertaining to the following courses should be directed to the instructor or to the College Office, 228 Mrak Hall.

Lower Division Courses

2. Concepts in Forestry (2) II Delwiche
Lecture—2 hours An introduction to the concepts of forestry as illustrated by current issues in the western United States

10. Natural Resources of California

(2) I, 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 and the adjacent states 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)

99. Special Study for Undergraduates (1-5) I, II, III The Staff (Whittig 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

108. Mineral Elements in Food Chains

(2) I Burau, Epstein, Rendig
Lecture—2 hours Prerequisite one course each in biological science and earth science or consent of instructor The 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 for some topics

110. Wildflowers of the Central Valley of California

(2) III Crampton
Lecture—2 hours 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

198. Directed Group Study (1-5) I, II, III The Staff (Whittig in charge) (P/NP grading only)

Rhetoric

(College of Letters and Science)

James J. Murphy, Ph.D., Chairperson of the Department

Department Office, 207 North Hall

Faculty

Gary L. Cronkrite, Ph.D., Associate Professor
Stan C. Johnson, M.A., Acting Assistant Professor
^{2,3} Stuart J. Kaplan, Ph.D., Assistant Professor
Michael C. Leff, Ph.D., Assistant Professor
Gerald P. Mohrmann, Ph.D., Professor
² James J. Murphy, Ph.D., Professor
⁴ Ralph S. Pomeroy, Ph.D., Associate Professor
F. Eugene Scott, 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	48
Rhetoric 110, 120, 153	12
One course from each of the following three groups (only 8 units required if Rhetoric 114 is offered in satisfaction of groups (a) and (c))	8-12
(a) Rhetoric 111, 112, 113, 114	
(b) Rhetoric 121, 122, 123	
(c) Rhetoric 114, 130, 141	
Rhetoric 190, 191	6
Additional upper division units in rhetoric to achieve a total of 36	6-10
Courses outside Department of Rhetoric	12

A coherent program of 12 upper division units selected in consultation with the major adviser from appropriate courses outside the Department of Rhetoric. This program will ordinarily be chosen from a designated set of courses related to one of the four course series in the Department of Rhetoric (Series 100, 110, 120, or 150).

Total Units for the Major 56

Major Advisers. G. L. Cronkrite, S. C. Johnson, S. J. Kaplan, M. C. Leff, G. P. Mohrmann, J. J. Murphy, R. S. Pomeroy, F. E. Scott, J. L. Vohs.

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. Cronkrite
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, Leff; III, Murphy
Lecture—4 hours. Origins of Greek and Roman rhetorical theory, with emphasis upon the contributions of Isocrates, Plato, Aristotle, Cicero, and Quintilian.

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) II. Scott
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. Scott
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, Johnson
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.

140. Mass Communication and the Public (4) II. Kaplan
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. Kaplan
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.

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) 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.
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 (1-4) 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 Oral Discourse (4) I, Cronkrite
Lecture—4 hours. Survey of traditional and current approaches to the study of human communication; special attention to bibliography and methodology, with sample research projects.

NOTE: For key to footnote symbols, see page 132.

Russian

210. The Evolution of Rhetorical Concepts (3) II. Murphy
Lecture—3 hours. Prerequisite: course 110 or consent of instructor. Analysis of a selected concept such as ethos, proof, structure, audience, or delivery. Topic selected will be traced through tradition to contemporary approaches.

211. Study of a Major Rhetorician (3) III. The Staff
Lecture—3 hours. Intensive study of a major theorist such as Aristotle, Cicero, Whately, or Toulmin, with emphasis upon cultural and intellectual environment.

220. Case Studies in Public Controversy (3) II. Scott
Lecture—3 hours. Prerequisite: one course from course 120 series or consent of instructor. Analysis of origins, development, and promulgation of conflicting views in public controversies such as slavery and temperance movement.

250. Rhetoric of Non-Oratorical Works (3) III. Pomeroy
Lecture—3 hours. Prerequisite: course 100 or consent of instructor. Study of rhetorical aspects of communications other than the public speech. Examination of rhetorical concepts in relation to news media, advertising, literature, with attention to nonverbal 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, 416 Sproul Hall

Faculty

*Andrew G. Comings, Ph.D., Assistant Professor
C. J. Gallant, Ph.D., Assistant Professor
George Genereux, Ph.D., Assistant Professor
Lawrence J. Grant, M.A., Lecturer
Vadim P. Kreydenkov, M.A., Lecturer
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 Language and Literature emphasis, concentrates on the evaluation of the literary movements and cultural trends that have expressed and shaped Russian national consciousness. This program can lead to graduate study and a career in teaching. The second program, the Translator and Pre-Interpreter emphasis, focuses on the practical language skills of translating and interpreting. This major, 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:

Preparatory Subject Matter	UNITS
(for either emphasis)	12-48
Russian 1 through 6 (or the equivalent)	0-36
Russian 40, 41, 42	12

Depth Subject Matter	36
Languages and Literature emphasis:	
Russian 101A, 101B, 101C, 102 or 103, 125, 127	24
Additional upper division units in Russian	12
Translator and Pre-Interpreter emphasis:	
Russian 101A, 101B, 101C, 102, 103, 104, 105, 160	32
Additional upper division units in Russian	4
Total Units for the Major	48-84

Major Adviser. C. J. Gallant.

Honors and Honors Program. The honors program comprises at least one quarter of study under course 194H, which will include a research paper. See also page 97.

Teaching Credential Subject Representative. G. Genereux. See page 107 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. A. G. Comings.

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. Reading, speaking, and composition; all students may study at their own speed and may contract for a grade. Only 4 units of credit will be allowed to students who have received credit for course 22 or 23. Not open for credit to students who have completed the first two years of high school Russian.

2. Elementary Russian (6) I, II, III. Grant and Staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 1. Reading, speaking and composition; all students may study at their own speed and may contract for a grade.

3. Elementary Russian (6) I, II, III. Grant and Staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 2. Reading, speaking and composition; all students may study at their own speed and may contract for a grade.

4. Intermediate Russian (6) I, II, III. Grant and Staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 1. Grammar review. Science students read texts in their specialization. Others read literature and increase conversational practice. Students may study at their own speed and may contract for a grade upon consent of instructor.

5. Intermediate Russian (6) I, II, III. Grant and Staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 4. Grammar review. Science students read texts in their specialization. Others read literature and increase conversational practice. Students may study at their own speed and may contract for a grade upon consent of instructor.

6. Intermediate Russian (6) I, II, III. Grant and Staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 5. Grammar review. Science students read texts in their specialization. Others read literature and increase conversational practice. Students may study at their own speed and may contract for a grade upon consent of instructor.

10. Elementary Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 1; course 2 or 3 to be taken concurrently. Conversational practice to improve pronunciation and master spoken idioms. May be repeated for credit up to a maximum of 6 units.

21. Elementary Scientific Russian (6) I, II, III. Grant and Staff
Reading and translation—5 hours; language laboratory—1 hour. Reading and translating from Russian to English; all students may study at their own speed and may contract for a grade.

22. Elementary Scientific Russian (6) I, II, III. Grant and Staff
Reading and translation—5 hours; language laboratory—1 hour. Prerequisite: course 21. Reading and translating from Russian to English; all students may study at their own speed and may contract for a grade.

23. Elementary Scientific Russian (6) I, II, III. Grant and Staff
Reading and translation—5 hours; language laboratory—1 hour. Prerequisite: course 22. Reading and translating from Russian to English; all students may study at their own speed and may contract for a grade.

30. Great Russian Writers (in English) (3) I, Grant
Lecture—3 hours. Introduction to the important prose and dramatic works of such writers as Gogol, Turgenev, Dostoevsky, Tolstoy, Chekhov, Sholokhov, and Pasternak. Offered in even-numbered years.

40. Survey of Russian Literature to 1800 (in English) (4) II. Tumins
Lecture—3 hours. Introduction to the philosophical, historical, and stylistic elements of Russian Literature from the earliest period up to Sentimentalism with a discussion of major writings and major literary figures. Offered in odd-numbered years.

41. Survey of Nineteenth-Century Russian Literature (in English) (4) I, Comings
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 odd-numbered years.

42. Survey of Twentieth-Century Russian Literature (in English) (4) III. Genereux
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 even-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 Conversation and Reading (4) I, Grant
Lecture—1 hour; discussion—2 hours; individual reading with instructor—1 hour. Prerequisite: course 6. Conversational practice based partly on reading materials (news-papers and literature). Student develops passive vocabulary by reading and active vocabulary by conversing.

101B. Advanced Conversation and Reading (4) II. Grant
Lecture—1 hour; discussion—2 hours; individual recitation with instructor—1 hour. Prerequisite: course 6. Conversational practice based partly on reading materials (news-papers and literature). Student develops passive vocabulary by reading and active vocabulary by conversing.

101C. Advanced Conversation and Reading (4) III. Grant
Lecture—1 hour; discussion—2 hours; individual recitation with instructor—1 hour. Prerequisite: course 6. Conversational practice based partly on reading materials (news-papers and literature). Student develops passive vocabulary by reading and active vocabulary by conversing.

102. Russian Composition (4) I, Kreydenkov
Recitation—3 hours. Prerequisite: course 101C.

103. Literary Translation (4) III. Genereux
Discussion—3 hours. Prerequisite: course 101C. Translation of Russian literary texts into stylistically equivalent idiomatic English.

104. Scientific Translation (4) I. Genereux
Discussion—3 hours; individual consultation—1 hour. Prerequisite: course 6 or consent of instructor. Translation of Russian scientific texts. Each student will read materials selected from his field of interest.

105. Advanced Russian Conversation (4) II. Tumins
Conversation—3 hours; preparation of texts—1 hour. Prerequisite: course 6. Intensive conversational practice and discussion based on current events and contemporary texts.

106. Contemporary Language and Communication (4) III. Kreydenkov
Lecture—1 hour; discussion—2 hours; individual projects—1 hour. Prerequisite: courses 101A, 101B, 101C, or consent of instructor. Contemporary language usage as a mirror of Soviet social, cultural, and political phenomena. An analysis and discussion of selected texts.

107. Russian Oral Interpreting (4) III. Tumins
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 101A, 101B, 101C or consent of instructor. Study of diachronic interpreting technique. Exercises in retaining speakers words, and interpreting of conversations, discussions and speeches from English into Russian and Russian into English. Politics, business, education, literature and other fields will be considered.

121. The Nineteenth-Century Russian Novel (In English) (4) II. Genereux
Lecture—3 hours; discussion—1 hour. Origin and development of the novelistic tradition beginning with Pushkin, Lermontov, Gogol, and continuing with such writers as Goncharov, Turgenyev, and Saltykov (excluding Tolstoy and Dostoevsky).

123. The Twentieth-Century Russian Novel (in English) (4) II. Genereux
Lecture—3 hours. Examination of various trends including Critical Realism, Symbolism, Neorealism, and Socialist Realism in development of the novel. Readings from such writers as Gorky, Zamiatin, Sholokhov, and Pasternak.

124. History of Russian Literary and Social Criticism (4) II. Genereux
Lecture—3 hours; term paper. Knowledge of Russian not required. Natural-School and Slavophile criticism contrasted to "esthetic" criticism. Revolutionary-democratic social writings; conservatives; symbolists; formalists; Marxists, and anti-Marxist criticism. Critical writings of major novelists.

125. Russian Drama to 1917 (4) III. Tumins
Lecture—3 hours. Prerequisite: course 6. The rise and development of Russian drama. Reading and analysis of Fonvizin and nineteenth-century dramatic works by authors such as Griboedov, Pushkin, Ostrovsky, A. K. Tolstoy, Leo Tolstoy, Chekhov, and Gorky. Offered in odd-numbered years.

126. The Russian Theater (in English) (4) I. Genereux
Lecture—3 hours; discussion—1 hour. The main works of Russian dramatists from Gogol to the present, including Turgenyev, Tolstoy, Chekhov, Gorky, Mayakovsky, Bulgakov, Shvarts. Offered in even-numbered years.

127. The Golden Age of Russian Poetry (4) III. Comings
Lecture—3 hours. Prerequisite: course 101A. Study of Russian versification, the historical background to the Golden Age, and readings from Derzhavin, Baliushkov, Gnedich, Pushkin, Delvig, Baratynsky, Lermontov, and other poets of the first half of the nineteenth century. Offered in even-numbered years.

128. Modern Russian Poets (4) III. Comings
Lecture—3 hours. Knowledge of Russian not required; Russian majors fulfill readings in Russian. Readings in translation of modern poetry belonging to various "schools" (e.g., Symbolism, Acmeism, Futurism) including

such poets as Blok, Esenin, Akhmatova, Maiakovsky, Pasternak, and Evtushenko. Offered in odd-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. Comings
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.

154. Russian Folklore (4) III. Gallant
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.

160. Russian Pronunciation (4) III. Gallant
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 1. Intensive instruction and drill in the pronunciation of Russian. Students will make individual tapes weekly to be evaluated in detail by instructor. Lectures will deal also with the scientific description and analysis of the Russian sound system in terms of both phonetics and phonemics.

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.

202. Historical Russian Grammar (4) II. Gallant
Lecture—3 hours; reading projects—1 hour. Evolution of the Russian phonological and grammatical systems from the eleventh to the eighteenth centuries.

204. Descriptive Russian Grammar (4) III. Gallant
Lecture—3 hours; reading projects—1 hour. Introduction to modern Russian phonology and morphology.

210A. Style and Syntax (4) I, Kreydenkov
Discussion—3 hours; reading projects—1 hour. Examination of stylistic differences between spoken and written Russian.

210B. Style and Syntax (4) II. Kreydenkov
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) III. 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.

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.

222. Nineteenth-Century Russian Literature (4) I, Tumins, Comings, Genereux
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.

223. Early Twentieth-Century Russian Literature (4) I, Comings
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.

224. Soviet Russian Literature (4) III. Genereux
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.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-9) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

300. The Teaching of Russian (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in a modern foreign language. Study of various methods of teaching a foreign language at elementary, high school, and college levels. Organization and methods of other language learning media, i.e., private language schools, television, and radio.

Russian Literature and History

(College of Letters and Science)

Program Office, 415 Sproul Hall

Committee in Charge

Valerie A. Tumins, Ph.D. (*Russian*); Committee Chairperson
Robert O. Crummey, Ph.D. (*History*)
George Genereux, Ph.D. (*Russian*)
Washke F. Pfeffer, Ph.D. (*Mathematics*)

The Major Program

This major is designed to give the student a better understanding of Russian through the study of its history and literature, two fields closely linked in its intellectual development.

The major will prepare a student for graduate studies in either field—Russian history or Russian literature, or in a similarly combined program. In either case the knowledge of Russian is a prerequisite.

Russian Literature and History

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-60
History 4A, 4B, 4C	12

NOTE: For key to footnote symbols, see page 132.

Sociology

Russian 1 through 6 (or the equivalent)	0-36
Russian 40, 41, 42	12
Depth Subject Matter	40
Three courses from History 102F, 137A, 137B, 137C	12
At least 8 additional upper division units in another field of history (preferably European or East Asian)	8
Three courses from Russian 101A, 101B, 101C, 102, 103	12
At least two courses from Russian 121, 123, 125, 127, 128, 140, 141	8
Total Units for the Major	64-100

Select 12 units from Anthropology 1, 2; Economics 1A, 1B, 2A, 2B, 2C; History 3, 4B, 4C, 17A, 17B, 21A; Linguistics 35; Political Science 1, 2, 3, 4; Psychology 1, 15	12
Depth Subject Matter	36
Sociology 165A, 165B	8
At least 28 additional units in upper division sociology courses to achieve a minimum of 36 units	28
Total Units for the Major	61

Recommended
 Anthropology 102, 118, 119A, 119B, 124, 128; History 101, 102; Mathematics 105A, 105B; Philosophy 12A, 12B, 21, 22, 23, 109, 151, 156; Political Science 150, 161; Psychology 145.

Sociology

A.B. Degree Requirements:

Criminal Justice and Social Welfare Options	UNITS
Preparatory Subject Matter (for either option)	25-27
Sociology 1, 3, 46A, 46B	17
Two courses from Anthropology 1, 2, Economics 1A, 1B, 2A, 2B, 2C, History 3, 4B, 4C, 17A, 17B, 21A, Political Science 1, 4, Psychology 1, 16	8-10
Depth Subject Matter	39
Criminal Justice Option:	
Sociology 120, 150, 152, 153	15
Two courses from Sociology 140, 143, 165B, 180	8
At least two courses from Sociology 122, 130, 155, 185	8
At least 8 additional units in upper division sociology courses	8
Social Welfare Option:	
Sociology 131, 185, 186	11
Sociology 154 or 156	4
At least two courses from Sociology 140, 143, 165B, 180	8
At least two courses from Sociology 120, 123, 127, 130, 132, 152	8-9
Additional units in upper division sociology courses to achieve a minimum of 39	7-8
Total Units for the Major	64-66

Recommended
 Anthropology 1, 118, 119A, 119B, 124, 128; History 101, 102; Mathematics 105A, 105B; Philosophy 12A, 12B, 21, 22, 23, 102, 109, 118, 151, 156; Political Science 150, 161; Psychology 145.

Major Advisers. Consult the Department Office.

Teaching Credential Subject Representative. J. Roth. See page 107 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, II, 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) 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) II. Hackett

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.

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

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 (Mayhew in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

102. Sociology of the Environment (4) II. 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.

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) III.

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

Sociology

(College of Letters and Science)

Bruce Hackett, Ph.D., Chairperson of the Department
 Department Office, 135 Young Hall

Faculty

James C. Cramer, Ph.D., Assistant Professor
 Ruth Dixon, Ph.D., Associate Professor
 Bruce Hackett, Ph.D., Associate Professor
 Gary G. Hamilton, M.A., Assistant Professor
 Travis Hirschi, Ph.D., Professor
 Carl C. Jorgensen, Ph.D., Assistant Professor
 (Sociology, Psychology)
 Edwin M. Lemert, Ph.D., Professor
 *John Lofland, Ph.D., Professor
 Lyn Lofland, Ph.D., Assistant Professor
 Leon H. Mayhew, Ph.D., Professor
 †Thomas W. Pullum, Ph.D., Associate Professor
 Julius Roth, Ph.D., Professor
 John F. Scott, Ph.D., Professor
 †Lenore Weitzman, Ph.D., Assistant 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 Criminal Justice or Social Welfare option.

Sociology

A.B. Degree Requirements:

Preparatory Subject Matter—General Major	UNITS
Sociology 1, 46A, 46B (or the equivalent)	25
	13

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. Advanced General Sociology (5) I, II, III. The Staff
Lecture—4 hours; to be arranged—1 hour. Prerequisite: upper division standing and consent of instructor. Analysis of sociological research and concepts emphasizing application of the basic concepts of social organization, culture, socialization, stratification in relation to specific selected problems of analysis. May be repeated for credit with consent of instructor. Limited enrollment.

109A-109B-109C. Seminar in Sociological Analysis (2-2-2) I-II-III. The Staff
Seminar—2 hours. Prerequisite: upper division standing and 9 units of sociology. 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.)

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'état*, revolutionary war, etc.

120. Deviation and Society (5) I, Lemert
Lecture—4 hours; term paper. 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) III. 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 (5) II. Scott
Lecture—4 hours; term paper. 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 intelligentia; 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.

130. Race Relations (4) I, III. 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 (5) I, Scott
Lecture—4 hours; term paper. Social implications of primate reproductive physiology; the nuclear family; major familial roles; normative controls on sex and reproduction; inheritance groups; status ascription; the family and stratification; marital selection; relations between the family and industrial social change.

132. The Sociology of Sex Roles (4) II.
Lecture—3 hours; discussion—1 hour. Analysis of biological, psychological, cultural and structural conditions underlying the status and roles of men and women in contemporary society, drawing on a historical and comparative perspective.

140. Social Stratification (4) III. Hackett
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.

143. Urban Society (4) I, 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) III. 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) III. Lemert
Lecture—4 hours. Sociological analysis of criminal behavior in relation to social structure and the criminalization process.

152. Juvenile Delinquency (4) II. Hirschi
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.

153. Practicum in Delinquency and Criminology (2) II. Hirschi, Lemert
Lecture—2 hours. The criminal justice system as seen by practitioners; attorneys, police, probation officers, judges, legislators, therapists, convicts. Provides exposure to workers in the field and the literature on their activities. Students interested in research and theory are encouraged to take courses 150 and 152.

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. Lemert
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. Sociology of Complaint and Protest (4) III. J. Lofland
Lecture—4 hours; term paper. Conditions and types of felt grievances and the forms, processes, strategies and effects of complaining and protesting in various institutional realms, particularly the political and economic. Emphasis upon developing generalized principles and processes from the study of documented episodes of complaining and protesting.

159. Sociology of Occupations (4) II. 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, Mayhew
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. Mayhew
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.

170. Population (4) I, 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 everyday life.

180. Complex Social Organization (4) II. 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

Soil and Water Science

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) I.

Lecture—4 hours. A sociological analysis of the evolution and current organization of welfare functions in modern societies.

186. Practicum in Social Welfare (2) III. Scott

Lecture—2 hours. The social welfare system as seen by practitioners, social workers, welfare administrators, welfare movement leaders, legislators, community organizers. Provides exposure to workers in the field and the literature on their activities, through lectures by nonacademic welfare professionals.

197T. Tutoring in Sociology (1-4) I, II, III. The Staff (Mayhew 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 (Mayhew in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Mayhew in charge)

Prerequisite: open to seniors only. (P/NP grading only.)

Graduate Courses

205. Methodological Critique of Research (4) III. Hirschi
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 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, pending completion of sequence.)

219A-219B. Behavioral Political Sociology (4-4) I-II McEvoy

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, Lemert

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

242. Comparative Method in Historical Sociology (4) III
Lecture-discussion—3 hours. Prerequisite: course 142 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 hypotheses; the meaning of analogy, correspondence, and causality

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. Social Movements (4) II. J. Lofland

Lecture-discussion—4 hours. Prerequisite: graduate standing, undergraduates with consent of instructor. Advanced study of selected aspects of social and revolutionary movements. Particular focus upon the relations between internal organization of movements; kinds and amounts of change sought; strategies and tactics adopted; and the structure of and impact on the larger society.

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 Weitzman

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 admission of law, and (3) the capacity of law to affect social behavior.

264. Proseminar in Sociology (4) I, 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 Pullum

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-292C. Field Research (4-4-4) I-II-III J. Lofland

Seminar—3 hours. Prerequisite: graduate standing. Perspective, logic and techniques of qualitative social research and analysis; the nature and uses of intensive interviewing, participant observation, and analytic ethnography. Application of field research principles is stressed: each participant develops, conducts, and completes a three-quarter field work project. (Deferred grading only, pending completion of sequence)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Individual Study (1-9) 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 include 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 international 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* courses taken to satisfy the requirements are shown in parentheses where possible. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	63-66
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 4A-4B-4C)	9-12
Geology (Geology 2)	3
Economics or agricultural economics	3
English	8
Rhetoric	4
Depth Subject Matter	45
Physical sciences, biological sciences and/or mathematics with approval of adviser	18
Soil Science 2	4
Water Science 2	4
Upper division units in soil science and water science	16

Special study or experience (199 or Work-Learn 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	
to supplement or expand areas of student interest selected with approval of adviser	26
Unrestricted Electives	21-24
Total Units for the Major	180

Major Adviser. D. E. Rolston (*Land, Air and Water Resources*).

Graduate Study. See page 101.

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, page 294.

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*.

Graduate Advisers. O. A. Lorenz (*Vegetable Crops*), H. M. Reisenauer (*Land, Air and Water Resources*).

Related Courses. See Plant Science 116, Resource Sciences 108; and Water Science courses.

COURSES IN SOIL SCIENCE

Questions pertaining to the following courses should be directed to the instructor or to the College Office, 228 Mrak Hall.

Lower Division Courses

2. Introduction to Soil Science (4) II. Munns, Delwiche
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A-1B, Biological Sciences 1; Physics 2B or 2C 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.

10. Land and Life (2) I. Singer, Walker
Lecture—2 hours. Introduction to soils as parts of ecosystems. The relationship of soils to man and land use.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

NOTE: For key to footnote symbols, see page 132.

Upper Division Courses

102. Soil and Water Chemistry (5) II. Burau
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 2 or 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, Singer
On campus—1 week daily; 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 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 (3) II. Singer
Lecture—2 hours and discussion—1 hour; (including 4 field trips). Prerequisite: course 2 or consent of instructor. Physical and chemical characteristics of soils and the position of soils on the landscape as they relate to agricultural and non-agricultural uses of land. Identification and interpretation of soil survey information applicable in land use decision making.

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-land form 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-land form relationships.

121. Soil Classification, Mapping and Evaluation (3) III. Huntington
Lecture—2 hours; laboratory—3 hours (4 or more lab periods and field studies). Prerequisite: course 120 or consent of instructor. Course introduces systems of soil classification to develop both a broader understanding of soils on the landscape and a basis for soil use evaluation. Laboratory-field studies investigate methods of morphological soil description, soil mapping and soil evaluation.

***122. Salt-Affected Soils** (3) II. Whittig, Epstein
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 and

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 only.

150. Soil and Plant Testing (3) III. Brown
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.

198. Directed Group Study (1-5) I, II, III. The Staff (Whittig 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 (Whittig 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 system. Offered in even-numbered years.

208. Soil-Plant Interrelationships (3) III. 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.

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. (SU 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 dis-

Spanish

cussed. Each participant will prepare and present reports to the seminar. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Whittig in charge)
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Whittig in charge)
(S/U grading only.)

Spanish

(College of Letters and Science)

Homero Castillo, Ph.D., Chairperson of the Department

Department Office (Spanish and Classics), 616 Sproul Hall

Faculty

Reed Anderson, Ph.D., Associate Professor
Carlota B. Cannon, Ph.D., Assistant Professor
Donald G. Castanien, Ph.D., Professor
Homero Castillo, Ph.D., Professor
Mariano González, Ph.D., Lecturer
Didier T. Jaén, Ph.D., Associate Professor
Daniel S. Keller, Ph.D., Associate Professor
Guillermo Rojas, Ph.D., Associate Professor
Santiago Rojas, M.A., Lecturer
Fabián A. Samaniego, M.A., Lecturer
Antonio Sánchez-Romeralo, Ph.D., Professor
Robert M. Scari, Ph.D., Associate Professor
Máximo Torrealba, Ph.D., Assistant Professor
Hugo J. Verani, Ph.D., Assistant Professor

The Major Program

The major in Spanish is designed to develop the student's competence in the spoken and written language and to provide opportunities for the advanced study of the literatures and cultures of Spain and Spanish-America. Technical study of the language is available through courses in general Spanish linguistics, phonetics, and syntax. Majors are strongly encouraged to complement their work in the department through studies in related areas of the humanities such as comparative literature, other languages and literatures, linguistics, art, history, and philosophy. The major in Spanish may lead to careers in teaching (Spanish, English as a second language, bilingual education). Skill in the language and knowledge of Hispanic culture are highly desirable for careers in such fields as international relations and business, library science, and public service.

Spanish

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	9-30
Spanish 1 or 1AT, 2 or 2AT, 3, 6 (or the equivalent)	0-21
Spanish 27A, 27B, 27C	9
Depth Subject Matter	36
Spanish 101A-101B-101C or 102A-102B-102C	12
Spanish 180 or 181	4
One course from each of the following three areas:	
(a) Literature of the golden age, Spanish 109, 111, 115	4

- (b) 19th- or 20th-century Spanish literature, Spanish 114, 119, 120A, 120B, 120C 4
- (c) 20th-century Spanish American literature, Spanish 108A, 108B, 125A, 125B, 127, 128, 129, 138 4

Note: Spanish 151 may be included in area (a), (b), or (c), depending upon major writer studied.

Eight additional upper division units in Spanish 8
Total Units for the Major 45-66

The above requirements must be fulfilled through courses offered by this Department. With the consent of the Chairperson, and upon the recommendation of the departmental adviser, exceptions may be allowed in special circumstances.

Students are urged to consult with a departmental adviser, especially in regard to work completed or to be completed at other institutions.

Majors and prospective majors who participate in the Education Abroad Program must consult with a departmental adviser prior to enrollment in the program.

Major Advisers. R. Anderson, C. B. Cannon, D. T. Jaén, D. S. Keller, G. Rojas, R. M. Scari.

Teaching Credential Subject Representative. D. S. Keller. See page 107 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. D. G. Castanien.

COURSES IN PORTUGUESE

Portuguese

Lower Division Courses

***1. Elementary Portuguese** (4) I.
Laboratory—2 hours; recitation—3 hours. Portuguese grammar, conversation, and reading. Not open for credit to students who have completed the first two years of high school Portuguese.

***2. Elementary Portuguese** (4) II.
Laboratory—2 hours; recitation—3 hours. Prerequisite: course 1. Continuation of course 1.

***3. Elementary Portuguese** (4) III.
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. Not open for credit to students who have completed the first two years of high school Spanish. An introduction to the fundamentals of Spanish grammar. Listening and speaking emphasized.

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. Not open for credit to students who have completed the first two years of high school Spanish.

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.

6. Intermediate Spanish: Conversation and Reading (3) I, II, III. The Staff (S. Rojas in charge)
Recitation—3 hours. Prerequisite: course 3. Spoken Spanish stressed through class discussion of a variety of selected readings. Practice in writing short compositions.

25. Chicano Culture (3) II. Rojas
Lecture—3 hours. 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 or minor in Spanish.

26. Introduction to the Forms of Chicano Literature (3) I, Rojas
Lecture—3 hours. Prerequisite: course 2 or consent of instructor. Analysis and interpretation of representative works in poetry, prose fiction, essay, and drama. Lectures and discussions in English. Readings in English and/or Spanish. May not be counted as part of the major or minor in Spanish.

27A-27B-27C. Introduction to the Forms of Hispanic Literature (3-3-3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 6. Introductory study of the forms of Spanish and Spanish-American prose and poetry; analysis of particular works.

30A. Conversational Spanish (3) I. The Staff
Lecture—3 hours. Prerequisite: course 6 or consent of instructor. Intensive conversational practice, stressing accurate pronunciation, verbal fluency.

30B. Conversational Spanish (3) II. The Staff
Lecture—3 hours. Prerequisite: course 30A or consent of instructor. Continuation of course 30A.

30C. Conversational Spanish (3) III. The Staff
Lecture—3 hours. Prerequisite: course 30B or consent of instructor. Continuation of course 30B.

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 translations. Lectures and discussions 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

101A-101B-101C. Grammar and Composition (4-4-4) I-II-III. The Staff
Lecture—3 hours; instructor-student conferences. Prerequisite: course 6.

102A-102B-102C. Grammar and Composition for Native Speakers (4-4-4) I, II, III. Rojas
Lecture—3 hours; conferences and reports. Prerequisite: open to students whose native language is Spanish or to those who are bilingual; consent of instructor.

106. Literature of Colonial Spanish America (4) I, Castanien
Lecture—3 hours; conferences and reports. Prerequisite: course 27C. 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. The literary development of Spanish America between independence and Modernism.

108A. Spanish-American Prose of the Twentieth Century (4) III. Castillo
Lecture—3 hours; conferences and reports. Prerequisite: course 27C. 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 27C. 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 27C. Offered in even-numbered years.

111. Don Quijote (4) II. Castanien
Lecture—3 hours. Prerequisite: course 27C.

114. Spanish Romantic Literature (4) I, Scari
Lecture—3 hours; conferences and reports. Prerequisite:

course 27C. 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 27C. Offered in odd-numbered years.

119. Spanish Novel of the Nineteenth Century (4) III. Scari
Lecture—3 hours. Prerequisite: course 27C. Offered in odd-numbered years.

120A. Twentieth-Century Spanish Prose (4) I, Anderson
Lecture—3 hours. Prerequisite: course 27C.

120B. Twentieth-Century Spanish Drama (4) III. Anderson
Lecture—3 hours. Prerequisite: course 27C. Offered in odd-numbered years.

120C. Twentieth-Century Spanish Poetry (4) III. Anderson, Sánchez-Romeralo
Lecture—3 hours. Prerequisite: course 27C. Offered in even-numbered years.

125A. Modernism: The Precursors (4) I, Castillo
Lecture—3 hours. Prerequisite: course 27C. Offered in even-numbered years.

125B. Modernism: The Major Poets (4) II. Castillo
Lecture—3 hours. Prerequisite: course 27C. Offered in even-numbered years.

127. Poetry of Post-Modernism and Vanguardism (4) III. Verani
Lecture—3 hours; conferences. Prerequisite: course 27C. Offered in even-numbered years.

128. Contemporary Spanish-American Short Story Writers (4) II. Castillo
Lecture—3 hours; conferences and reports. Prerequisite: course 27C. 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 27C 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 101C or 102C 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 101C or 102C 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 6 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 27C or consent of instructor.

135. Survey of Mexican Culture (4) III. Rojas
Lecture—3 hours; conferences and reports. Prerequisite: course 27C or consent of instructor.

138. Contemporary Spanish-American Drama (4) II. Keller
Lecture—3 hours; conferences and reports. Prerequisite: course 27C. 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 27C. 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 27C. Basic concepts for the analysis of literature with emphasis on Spanish literary and critical theory applied to Spanish literature.

180. History of Spanish Literature (4) III. Scari
Lecture—3 hours. Prerequisite: open only to majors in their senior year; consent of instructor.

181. History of Spanish-American Literature (4) II. Keller
Lecture—3 hours; conferences and reports. Prerequisite: open only to majors with senior standing; consent of instructor.

192I. Internship in Spanish (1-4) I, II, III. The Staff (Chairperson in charge)
Field work. Prerequisite: course 101A-101B-101C or 102A-102B-102C; 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, Castillo
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. Prerequisite: course 220A or consent of instructor. Descriptive and historical study of the distinctive features of Peninsular and American Spanish dialects.

225. Medieval Spanish Literature (4) II. 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.

NOTE: For key to footnote symbols, see page 132.

Subject A; Surgery

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 Ganivent 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. Cannon
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. Castillo
Seminar—3 hours. Offered in even-numbered years.

241B. Spanish-American Novel, 1920-1940 (4) II. Castillo
Seminar—3 hours. Offered in odd-numbered years.

242. New Trends in Spanish-American Fiction from 1940 to the Present (4) III. Castillo
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. Castillo
Seminar—3 hours. Special study of the forerunners of *Modernismo*. Emphasis on the works of Marfí, Díaz-Miron, Gutiérrez-Nájera, Casal and Silva.

245. Dario and His Contemporaries (4) II. Castillo
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

390. Problems in Teaching Spanish at College Level (1) I. 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.

Subject A

(College of Letters and Science)

Program Office, 906 Sproul Hall

Faculty

Thomas A. Weaver, Ph.D., Lecturer
Karl F. Zender, Ph.D., Lecturer and Supervisor of Instruction

University Requirement

See page 60 for detailed information about the Subject A requirement.

COURSE IN SUBJECT A

Subject A. English Composition (no credit) I, II, III. The Staff (Weaver in charge)
Lecture-discussion—4 hours. Principles of composition, with special emphasis on precision and exactness of sentences. (P/NP grading only.)

Surgery

(School of Veterinary Medicine)

John D. Wheat, D.V.M., Chairperson of the Department
Department Office, 1319 Haring Hall

Faculty

Eugene M. Breznock, D.V.M., Ph.D., Assistant Professor
S. Gary Brown, D.V.M., Assistant Clinical Professor
Robert M. Cello, D.V.M., Professor
I. M. Gourley, D.V.M., Ph.D., Professor
Robert Hart, M.R.C.V.S., D.V.A., D.V.M., Assistant Professor
Steve C. Haskins, D.V.M., M.S., Assistant Professor
Terrell A. Holliday, D.V.M., Ph.D., Professor
Kenneth G. Kagan, D.V.M., Assistant Professor
Thomas G. Kawakami, Ph.D., Lecturer (*Pathology*)
Robert L. Leighton, D.V.M., Professor
A. D. MacMillan, D.V.M., Ph.D., Assistant Professor
Bruce R. Madewell, D.V.M., Assistant Professor
Dennis M. Meagher, D.V.M., Ph.D., Professor
Robert D. Norrie, D.V.M., Assistant Professor
Harold R. Parker, D.V.M., Ph.D., Associate Professor (*Surgery, Physiological Sciences*)
Charles T. Robinson, D.V.M., Assistant Clinical Professor
Fredrick P. Sattler, D.V.M., Assistant Clinical Professor
Robert R. Selcer, D.V.M., Assistant Professor
Harold D. Snow, D.V.M., Adjunct Assistant Professor (*School of Medicine, Los Angeles campus*)
Eugene P. Steffey, D.V.M., Ph.D., Assistant Professor
Gordon H. Theilen, D.V.M., Professor
John D. Wheat, D.V.M., Professor
Alida P. Wind, D.V.M., Lecturer

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

205. Advanced Veterinary Clinical Neurology (1) III. Holliday
Laboratory—2 hours. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. Extension of neurology portions of Medicine 204 and Veterinary Medicine 250. Some special techniques of neurological examination, electroencephalography, electromyography, and neuroradiography. Discussions emphasizing the anatomical, physiological, and pathological basis of the techniques and interpretation of the results. Limited enrollment.

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.

208. Soft Tissue Surgery: Small Animals (1) III. Leighton
Laboratory—3 hours. Prerequisite: senior standing in the School of Veterinary Medicine, graduate students, or consent of instructor. Course is designed to provide further experience in surgery of small animals with emphasis on practical soft tissue surgery. Open to students who have not had course 224. Limited enrollment. (S/U grading only for Veterinary students.)

224. Orthopedic Surgery: Small Animals (2) II. Wind
Lecture—1 hour; laboratory—3 hours. Prerequisite: senior standing in School of Veterinary Medicine or consent of instructor. Elective course in orthopedic surgery with emphasis on common orthopedic problems in the dog and on the use of orthopedic equipment. Limited enrollment. (S/U grading only for Veterinary students.)

226. Veterinary Anesthesiology (1) II. Hart
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. Steffy

Lecture—1 hour. Prerequisite: graduate or 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 (1-2) I, II, III. The Staff (Wheat in charge)

299. Research (1-9) 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 or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for preoperative preparation of hospital patients, assistance at operating and postoperative 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. Small Animal 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 or resident 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 (Hart 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. Cello

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.)

NOTE: For key to footnote symbols, see page 132.

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. May be repeated for credit. (S/U grading only.)

Swedish

(College of Letters and Science)

Department Office (German and Russian), 416
Sprout Hall

Faculty

Fritz Sammern-Frankenegg, Ph.D., Assistant
Professor (Swedish, German)

COURSES IN SWEDISH

Lower Division Courses

1. **Elementary Swedish** (6) I, Sammern-Frankenegg
Discussion—5 hours; language laboratory—two ½-hour sessions. Not open for credit to students who have completed the first two years of high school Swedish.

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.)

Textiles and Clothing

(College of Agricultural and Environmental
Sciences)

Harold P. Lundgren, Ph.D., Chairperson of the
Division

Division Office, 129 Everson Hall (752-6650)

Faculty

Harold P. Lundgren, Ph.D., Acting Professor
Emory Menefee, Ph.D., Adjunct Professor
Mary Ann Morris, Ph.D., Professor
Howard L. Needles, Ph.D., Associate Professor
Allen G. Pittman, Ph.D., Adjunct Professor
Barbara V. Pontrelli, A.B., Lecturer
Howard G. Schutz, Ph.D., Professor
S. Haig Zeronian, Ph.D., Associate Professor

The Major Program

The Textile major is concerned with the study of the chemical and physical properties, applica-

tions, and care of fibers and fabrics; their use in design; and the socioeconomic aspects of textiles. Two options are offered: (a) *Textile Science* places emphasis on the scientific disciplines related to textiles and can lead to careers in research and development, technical service, product control, merchandising, and marketing; (b) *Consumer Textiles* stresses the social science-business aspects of textiles and clothing and can lead to careers in merchandising, extension service, design, creative writing, and teaching (after completion of an additional year in the teaching credential program). Majors interested in a career in textile chemistry are advised to take additional elective course work in chemistry, physics, and mathematics after consultation with the Master Adviser. The Textiles major is qualified to enter graduate programs such as Consumer Science and Agricultural Chemistry with specializations in Textiles and Clothing or Textile Science.

The number of students in the Consumer Textiles option of this major may be restricted due to limitations in resources.

Textiles

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.)

Consumer Textiles Option

	UNITS
Preparatory Subject Matter	51-55
Cultural anthropology (Anthropology 2)	4
Introductory psychology (Psychology 1 or 16)	3-4
Statistics (Mathematics 13 or Economics 12)	4-5
Sociology (Sociology 1 or 3)	4-5
History or art, one course	3-4
Written expression, two courses (English 1, 2, 5F, 5P)	8
Oral expression, one course (Rhetoric 1)	4
Economics, principles of (Economics 1A, 1B or 2A, 2B, 2C)	10
Physical and biological sciences, two courses (Chemistry 10 or Physics 10, Biological Sciences 10)	8
Computer science (Mathematics 19)	3

Depth Subject Matter 51-52

Textiles and Clothing 6, 7, 17A, 17B, 162, 162L, 172, 175, 180A-180B	29
Consumer Economics 141	4
Consumer Science 100	3
Design 143 or 144	3-4
Agricultural Economics 18, 112	8
Psychology 145	4

Restricted Electives 30

Choose from courses Agricultural Economics 113, 117; Design 142A, 142B, 170A, 170B, 170C; Economics 11A, 11B, 134; Rhetoric 42, 140; Sociology 123, 126, 140, 148; Mathematics 16A, 16B, 16C; Textiles and Clothing 47.	
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Unrestricted Electives 43-47

Textile Science Option

Preparatory Subject Matter 56-64

Cultural anthropology (Anthropology 2) or Sociology, one course (Sociology 1 or 3)	4-5
Chemistry, including organic (Chemistry 1A-1B and 8A-8B or 128A-128B-128C)	16-19

Vegetable Crops

Physics (Physics 2A and 2B or 10)	4-6
Introductory psychology (Psychology 1 or 16)	3-4
Statistics, one course (Mathematics 13 or Economics 12)	4-5
Written expression, two courses (English 1, 2, 5F, 5P)	8
Oral expression, one course (Rhetoric 1)	4
Economics, principles of (Economics 1A-1B or 2A-2B-2C)	10
Computer science (Mathematics 19)	3
Depth Subject Matter	38
Textiles and Clothing 6, 7, 160, 160L, 161, 161L, 162, 162L, 172, 180A-180B	23
Consumer Economics 141	4
Agricultural Economics 18, 112	8
Consumer Science 100	3

Restricted Electives 35

Choose from courses:

Agricultural Science and Management 150; Agricultural Economics 113, 117; Biological Sciences 1; Chemistry 1C, 5, 107A, 107B, 108; Economics 11A, 11B, 134; Mathematics 16A, 16B, 16C; Physics 2C; Textiles and Clothing 17A, 17B, 47, 175; Rhetoric 42, 140; Psychology 145.

Unrestricted Electives 43-50

Total Units for the Major 180

Major Adviser. H. L. Needles.

Graduate Study. See page 101.

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 College Office, 228 Mrak Hall.

Note—Each course is listed under one of three groups:

- Clothing
- Textiles
- Field, Group, and Special Study

a) Clothing

7. Social and Psychological Aspects of Dress (3) I, III. The Staff

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, III. Pontrelli
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) I, II Pontrelli
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) II. The Staff
Lecture—3 hours. Prerequisite: course 6, and 7, an introductory course in economics (1A or 1B). A study of the clothing industry including the production, distribution and consumption of textile goods.

175. Experimental Problems in Clothing Structure (4) III. The Staff (Zeronian in charge)
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 17B, 162, and 172. Design and construction of body coverings utilizing technological innovations in fabrics

and in fabric joining. Influence of changing socioeconomic values on design and construction.

b) Textiles

6. Introduction to Textiles (3) I. Morris

Lecture—2 hours; laboratory—3 hours. Introduction to the structure and properties of textiles. Consumer use and fabric characteristics are emphasized.

160. Textile Fibers and Finishes (3) III. Needles

Lecture—3 hours. Prerequisite: course 6 and Chemistry 8B. Structural, physical and chemical properties of textile fibers in relation to end-use; the properties and classifications of dyes and finishes for textiles; chemistry and function of products used in textile maintenance.

160L. Textile Fibers and Finishes Laboratory (1) III. Needles

Laboratory—3 hours. Prerequisite: course 6, 160 (may be taken concurrently); Chemistry 8B. Demonstrates various physical and chemical properties of fibers, application of dyes and finishes to textiles and their effect on fiber properties, and the effect of various detergent additives on textile maintenance.

161. Textile Chemistry (3) I. Zeronian

Lecture—3 hours. Prerequisite: course 160. The theory of fiber structure; the relation between chemical structure and physical properties of fibers. The principles of the application of dyes and finishes to textiles.

161L. Textile Chemistry Laboratory (2) I. Zeronian

Laboratory—6 hours. Prerequisite: course 161 (may be taken concurrently). Laboratory methods and procedures employed in studying chemical and physical properties of textile fibers.

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.

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. Lundgren

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. Lundgren

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 graduates. (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) II-III. The Staff (Needles in charge)

Prerequisite: textile major or 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.)

198. Directed Group Study (1-5) I, II, III. The Staff (Lundgren in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Lundgren in charge)
(P/NP grading only.)

298. Group Study (1-5) I, II, III. The Staff (Lundgren in charge)

299. Research (1-12) I, II, III. The Staff (Lundgren in charge)
(S/U grading only.)

Vegetable Crops

(College of Agricultural and Environmental Sciences)

Oscar A. Lorenz, Ph.D., Chairperson of the Department
Department Office, 151 Hunt Hall (752-1741)

Faculty

James P. Bennett, Ph.D., Assistant Professor
Jan Dvorak, Ph.D., Assistant Professor
William J. Flocker, Ph.D., Professor
James F. Harrington, Ph.D., Professor
Frederick D. Howard, Ph.D., Lecturer
James E. Knott, Sc.D., Professor Emeritus
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
Harlan K. Pratt, Ph.D., Professor
Lawrence Rappaport, Ph.D., Professor
Charles M. Rick, Ph.D., Professor
Paul G. Smith, Ph.D., Professor
Arthur R. Spurr, Ph.D., Professor
M. Allen Stevens, Ph.D., Lecturer
Masatoshi Yamaguchi, Ph.D., Professor
Shang Fa Yang, Ph.D., Lecturer

Related Major Programs. See the majors in Environmental Toxicology (page 208) and Plant Science (page 276).

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 101.

Graduate Adviser. L. L. Morris.

Related Courses. See Plant Science 112, 112L, 121A-121B-121C.

COURSES IN VEGETABLE CROPS

Upper Division Courses

100. Principles of Vegetable Crops (3) I. Lorenz
Lecture—3 hours. Prerequisite: Plant Science 1 and 2 or consent of instructor. The vegetable industry. Fundamentals of vegetable crop production, handling, processing and utilization. Demonstrations will supplement the lecture.

101. Major Vegetable Crops (4) II. Harrington
Lecture—4 hours. Prerequisite: Plant Science 1 and 2 or consent of instructor. Adaptation, growth habits and methods of culture and handling of the principal vegetable crops. The application of experimental evidence to production problems is stressed.

105. Systematic Olericulture (2) I, The Staff (Lorenz in charge)

Lecture—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 Harrington

Lecture—3 hours. Prerequisite: Botany 111B. Physiological factors affecting induction of seeding, seed development, viability and longevity of seed. Principles of seed production. One or more field trips.

150. Vegetables as World Food Crops (3) III Yamaguchi

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.

197. Field Study of Vegetable Industry (1) III. Flocker

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 (Lorenz in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Lorenz 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.)

291. Seminar in Postharvest Physiology (1) I, II, III The Staff (Pratt in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Intensive study of selected topics in the field of postharvest physiology of fruits and vegetables. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Yamaguchi 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 (Lorenz 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

George H. Cardinet III, D.V.M., Ph.D., Associate

Dean—Student Services

William J. Winchester, D.V.M., Assistant Dean

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Faculty

Kurt Benirschke, M.D., Clinical Professor

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Professor

Charles S. Crane, D.V.M., Associate Clinical

Professor

Robert E. Dickerson, D.V.M., Associate Clinical

Professor

Robert S. Dickson, D.V.M., Associate Clinical

Professor

Frederic L. Frye, D.V.M., Clinical Professor

Robert J. Harris, D.V.M., Associate Clinical

Professor

James R. Howard, D.V.M., Ph.D., Associate

Clinical Professor

Gary R. Kuehn, D.V.M., Assistant Clinical

Professor

Ronald S. Laub, D.V.M., Associate Clinical

Professor

Gerald R. Mitchell, D.V.M., Associate Clinical

Professor

Jack W. Morse, D.V.M., Associate Clinical

Professor

James D. Russell, D.V.M., Assistant Clinical

Professor

COURSES IN VETERINARY MEDICINE

Upper Division Courses

100. Veterinary Medicine: Orientation (2-1-1) I, II, III.

McGowan and staff

Seminar—1 hour; laboratory—5 hours; field trips. Prerequisite: first-year standing in School of Veterinary Medicine; consent of instructor. An overview of the Veterinary Medical profession emphasizing its many integrant parts and publics; environmental needs of a wide spectrum of animal species pointing up unique biological characteristics and necessities; breeds recognition; interrelationships of the animal kingdom and mankind. Course runs for 36 weeks. (P/NP grading only.)

101. The Normal Animal, Examination, and Topographic Anatomy (3) I, Kitchell and staff

Lecture—2 hours; laboratory—4 hours Prerequisite: freshman standing in the School of Veterinary Medicine. Anatomic structures, features and landmarks fundamental to an integrated study of organ systems, the performance of physical examination, and routine diagnostic and therapeutic procedures.

102A. Cell Biology (6) I, Black and staff

Lecture—4 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: freshman standing in the School of Veterinary Medicine. Physical-chemical principles underly-

ing biological processes; intermediary metabolism and its control. The course will emphasize structural-functional relationships from the molecular to the tissue level to give a background for understanding.

102B. Cell Biology (5) I, Black and staff

Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: freshman standing in the School of Veterinary Medicine. Physical-chemical principles underlying biological processes; intermediary metabolism and its control. The course will emphasize structural-functional relationships from the molecular to the tissue level to give a background for understanding.

103. General Principles of Pharmacology (3) II. Conzelman, Giri, Joy, Segall

Lecture—2 hours; laboratory-demonstration-discussion—2 hours. Prerequisite: biochemical and cellular bases of veterinary medicine and supracellular organizations, or consent of instructor. Designed to provide veterinary medical students with basic foundation for understanding how drugs are used to restore diseased animals to normal health. Lectures-demonstrations-discussions on pharmacokinetics, drug metabolism, pharmacodynamics, toxicity, and pharmacotherapeutics.

104. Fundamentals of Radiography (1½) II. Morgan and staff

Lecture—12 hours; laboratory—2 hours. Prerequisite: freshman standing in the School of Veterinary Medicine. The production of x-rays, description of x-ray-producing equipment, utilization of accessory equipment, principles of film processing, preparation of technique chart, and principles of positioning.

105A. Agents of Disease and Host Responses (4) I, Osebold

Lecture—22 hours total; laboratory—16 two-hour sessions. Prerequisite: sophomore standing in School of Veterinary Medicine. Course will furnish a basis for understanding diseases of infectious, parasitic, immunological, neoplastic and radiological nature, and includes general responses of vertebrate tissues to injury.

105B. Agents of Disease and Host Responses (9) I, Osebold

Lecture—54 hours total; laboratory—32 two-hour sessions. Prerequisite: sophomore standing in School of Veterinary Medicine. Course will furnish a basis for understanding diseases of infectious, parasitic, immunological, neoplastic and radiological nature, and includes general responses of vertebrate tissues to injury. (Deferred grading only, pending completion of 16-week session.)

105C. Agents of Disease and Host Responses (4) II, Osebold

Lecture—33 hours total; 30 one-hour demonstration laboratories. Prerequisite: sophomore standing in School of Veterinary Medicine. Course will furnish a basis for understanding diseases of infectious, parasitic, immunological, neoplastic and radiological nature, and includes general responses of vertebrate tissues to injury.

107. Principles of Anesthesiology and Surgery (5) I, Gourley, Meagher, 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.

108. Nutrition and Nutritional Diseases in Animals (4) II, Rogers, Morris, Hjerpe

Lecture—4 hours; one demonstration; one field trip. Prerequisite: second-year standing in the 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.

120. Musculoskeletal Basis of Locomotion (5) I, II, Kitchell and staff

Lecture—1 hour; laboratory—6 hours. Prerequisite: normal animal, examination, and topographic anatomy; biochemical and cellular bases of veterinary medicine; first-year standing in School of Veterinary Medicine. Gross, sub-

Veterinary Medicine

gross, light microscopic, electron microscopic, functional anatomy of the musculoskeletal system of selected domestic animals. (Deferred grading only pending completion of 16-week session.)

121. Neurosciences (6½) II. Hart

Lecture—4 hours; laboratory—3 hours. Prerequisite: normal animal, examination and topographic anatomy; biochemical and cellular bases of veterinary medicine; first-year standing in School of Veterinary Medicine. An integrated study of the nervous system relating anatomy, physiology, pharmacology, and animal behavior to veterinary medicine. (Deferred grading only, pending completion of 13-week session.)

125. Cardiopulmonary and Renal Systems: Normal Form and Function (8) III. Gillespie and staff

Lecture—56 hours total; laboratory—24 3-hour sessions (discussion-laboratory sessions flexible). Prerequisite: first-year standing in School of Veterinary Medicine. Correlated presentation emphasizing anatomical, physiological and pharmacological aspects of the cardiovascular, respiratory, and renal systems of common domesticated animals. (Homeostatic mechanisms governing body fluids and electrolytes will be included.) (Deferred grading only, pending completion of 13-week session commencing the last part of Winter Quarter and through Spring Quarter.)

130. Structure and Function of the Gastrointestinal System (4) III. Curry and staff

Lecture—26 hours total; laboratory—14 3-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. The structure and function of the normal gastrointestinal system, including ruminants, as a basis for understanding the disease process. Emphasis will be on integrating morphology and physiology with respect to gastrointestinal secretions, motility, absorption, and allied processes. Course runs for 9 weeks only.

131. Metabolism and Bioenergetics (2) II, III. Black and staff

Lecture—20 hours total. Prerequisite: first-year standing in School of Veterinary Medicine. Energetics of metabolic processes and 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. (Deferred grading only, pending completion of course.)

135. Hemolymphatic System: Normal Structure and Function (3) III. Jain and staff

Lecture—2 hours; laboratory—10 hours total. Prerequisite: freshman 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 tissues; hematopoiesis and its regulation; hemoglobin synthesis; blood groups; hemostasis and blood coagulation; methods of study including laboratory exercises.

136. Laboratory Practices (1) I, Kaneko and staff

Lecture—1 hour; laboratory—2 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Basic techniques in clinical hematology and chemistry necessary for adequate performance in the clinical rotation during the second year of the core curriculum. Course runs for 6 weekly only.

140. Endocrine System Normal and Abnormal Structure and Function (3) I, Kennedy

Lecture—22 hours; laboratory-discussion—9 sessions (discussion-laboratory sessions flexible). Prerequisite: sophomore standing in School of Veterinary Medicine. Correlated presentation of the structure and function of the normal and diseased endocrine glands of domesticated animals.

145. Reproduction (7) II, III. Kendrick and staff

Lecture—4 hours; laboratory—6 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Course covers structure, function, pathologic and clinical aspects of reproduction (normal and abnormal). (Deferred grading only, pending completion of 11-week session.)

170A-170B-170C. Hospital Practices (2) I-II-III. VMTH Staff (Low in charge)

Laboratory—6 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Instruction in the technical skills required for the diagnosis and treatment of animal patients. (P/NP grading only, deferred until completion of sequence.)

180A-180B-180C. Clinic Rounds for Freshmen (1) I-II-III. VMTH Staff (Low in charge)

Discussion—1 hour. Prerequisite: freshman standing in School of Veterinary Medicine. Basic aspects of clinical diagnosis. (P/NP grading only.)

181A, 181B, 181C. Rounds (1, 1, 1) I, II, III. VMTH Staff (Low in charge)

Discussion—2 hours. Prerequisite: sophomore standing in School of Veterinary Medicine. Discussion of selected cases from the clinic. (S/U grading only.)

Graduate Courses

203. Epidemiology, Statistics and Experimental Design (3) I, Ruppanner, Wiggins

Lecture—20 hours total; laboratory—10 hours total. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. This course will concentrate upon basic techniques for (1) epidemiological surveillance and (2) intensive epidemiological follow-up, as applied to (a) fattening-type operations (feedlots, broiler farms, etc.) and (b) breeder-type operations (dairies, cow-calf ranches, egg producers, etc.).

205. Equine Surgery (3) II. Norrie

Lecture—2 hours; laboratory—3 hours. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. A course designed to allow senior veterinary students additional training and experience with surgical procedures in the horse. Limited enrollment.

206. Equine Anesthesia and Intensive Care (1) I, Steffey

Lecture—1 hour. Prerequisite: senior 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) III. Hart

Lecture—1 hour; video tapes and home study. Prerequisite: junior standing; candidate for DVM degree. A course in 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.

209. Epidemiology, Public Health and Infectious Diseases (8) II. Howarth

Lecture—49 hours total; laboratory—13 hours total. Prerequisite: third-year standing in School of Veterinary Medicine. Introduction to preventive and population aspects of veterinary medicine, with special attention to zoonoses and systemic infections of animals. Course runs for 17 weeks. (Deferred grading only, pending completion of course.)

210. Veterinary Toxicology (3) I, Fowler

Lecture—3 hours. 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.

211A. Laboratory Animal Science (2) III. Brooks

Lecture—2 hours. Prerequisite: junior standing in the School of Veterinary Medicine, graduate student or consent of instructor. Basic management practices used in laboratory animal facilities, including husbandry procedures, animal welfare standards, facility design, nutrition, reproduction and sanitation.

211B. Laboratory Animal Medicine (2) I, Brooks

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.

212. Seminar in Zoological Medicine (1) I, Fowler; II, Raggi; III.

Seminar—1 hour. Prerequisite: enrollment in Zoological Medicine. Enrolled students will select a topic, prepare and present the topic to the class. (S/U grading only.)

213. Medical Primatology (2) II. 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) III. 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. Raggi

Lecture—2 hours. Prerequisite: senior 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) I, Fowler

Lecture—1 hour. Prerequisite: senior 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.

217L. Cage Bird Medicine Laboratory (1) I, Fowler

Laboratory—3 hours. Prerequisite: enrolled in Zoological Medicine Track. Laboratory sessions on the taxonomy, anatomy and physiology, clinical examination, radiographic examination, nutrition, parasites, anesthesia and surgery of cage birds.

218. Diseases of Free Living Wildlife (2) II. 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.

220. Musculoskeletal System: Abnormal Function (4) II. Wheat

Lecture—36 hours total; laboratory—six 2½-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. A course on 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. Course runs for 13 weeks. (Deferred grading only, pending completion of course.)

221. Neurology: Abnormal (4) III. Holliday

Lecture—36 hours; laboratory—six 2½-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. A course on abnormal function of the nervous system and diseases affecting the nervous system in animals. The manifestation of diseases, pathology, pathogenesis, diagnosis and medical and surgical treatments of neurologic disease will be discussed.

222. Veterinary Ophthalmology (3) II. Cello

Lecture—21 hours total; laboratory—7 three-hour sessions. Prerequisite: third-year standing in the School of Veterinary Medicine. The normal structure and function of the eye and the response of the eye to disease. All species of domestic animals will be included. Discussion of selected ocular diseases of various species.

223. Small Animal Ophthalmology (2) III. Cello

Lecture—2 hours. Prerequisite: course 222. The diagnosis and treatment of commonly encountered eye diseases of small animals.

225. Cardiopulmonary, Renal, Abnormal (9) I, II. Dungworth

Lecture—68 hours total; laboratory—66 hours. Prerequisite: third-year standing in School of Veterinary Medicine. A course on 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 sequence.)

226. Advanced Small Animal Cardiology (1½) III. Rhode
Lecture—15 hours total for course. Prerequisite: course 225 or the equivalent. Cardiovascular diseases of canine and feline species.

227A. Equine Medicine (2) I. Carlson
Lecture—20 hours total. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. Advanced equine medical diseases including sections on general medicine, respiratory medicine, cardiology, dermatology, neurology, oncology and ophthalmology.

227B. Equine Medicine (3) II. Carlson
Lecture—25 hours total; discussion—5 hours total. Prerequisite: senior standing in the School of Veterinary Medicine. Advanced equine medical diseases including sections on general medicine, respiratory medicine, cardiology, dermatology, neurology, oncology and ophthalmology.

228. Food Animal Medicine (2) I. Hjerpe in charge
Lecture—2 hours. Prerequisite: fourth-year standing in the 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 the 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) II. Hjerpe in charge
Lecture—3 hours. Practical systems 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.

230. Gastrointestinal Diseases: Gastroenterology (6) II, III. Strombeck

Lecture—53 hours total; nine laboratory sessions—23 hours total. Prerequisite: second-year standing in School of Veterinary Medicine. A course on 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. (Deferred grading only, pending completion of sequence.)

235. Hemolymphatic: Abnormal (6) I. Osburn
Lecture—39 hours total; laboratory 42 hours total. Prerequisite: third-year standing in the School of Veterinary Medicine. A course on 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 Reproduction (1) III. Stabenfeldt
Lecture—1 hour. Prerequisite: fourth-year standing in the School of Veterinary Medicine. Conditions affecting the reproductive system in the dog and cat, with emphasis on symptomatology, pathophysiology and treatment. The development of logical diagnostic and therapeutic approaches to the clinical patient will be stressed.

246. Food Animal Reproduction (3) I. Drost and Kendrick in charge
Lecture—2 hours. Prerequisite: course 145. Conditions affecting the reproductive system in the cow, sow, ewe and goat, with emphasis on symptomatology, pathophysiology and treatment. Development of logical diagnostic and therapeutic approaches to the clinical patient will be stressed.

247. Equine Reproduction (3) I. Hughes
Lecture—2 hours; laboratory—6 meetings total. Prerequisite: senior standing in the School of Veterinary Medicine or consent of instructor. Advanced lecture and laboratory course dealing with reproduction and infertility in the horse.

249. Clinics (2-8) (Summer—Extra Session) VMTH Staff (Low in charge)
Prerequisite: completion of third-year of study in veterinary medicine. Diagnosis and treatment of animal diseases. Students have responsibility for case records, care of patients, physical examinations, and participation in surgery. Laboratory exercises in restraint, diagnostic and therapeutic procedures, and surgical techniques. (S/U grading only.)

255. Integumentary System (5) I. Stannard
Lecture—45 hours total; laboratory—10 hours total. Prerequisite: third-year standing in the 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) I. Parker in charge
Lecture—14 meetings total; laboratory—3 meetings total. Prerequisite: fourth-year standing in the 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) I. Wind
Lecture—15 meetings total; laboratory—3 meetings total. Prerequisite: fourth-year standing in the 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. Morgan and staff
Lecture—3 hours. Prerequisite: fourth-year standing in the 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 (5) III. Meagher, O'Brien, Lohse, Pool
Lecture—4 hours; laboratory—3 hours. Prerequisite: third-year standing in the 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.

270A-270B-270C. Hospital Practices (6-6-6) I-II-III. VMTH Staff (Low in charge)
Clinic—20 hours. Prerequisite: third-year standing in the School of Veterinary Medicine. Clinical training in veterinary medicine. The student will have assignments in the medical and surgical services and clinical diagnostic laboratories of the Veterinary Medical Teaching Hospital. (S/U grading only. Grading deferred to end of Spring quarter.)

271. Urban Practice Clinics (10-15) I, II, III. VMTH Staff (Ling in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in the School of Veterinary Medicine. Clinical training for senior veterinary students enrolled in track programs. (S/U grading only.)

272. Large Animal Practice Clinics (10-15) I, II, III. VMTH Staff (Knight in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in the School of Veterinary Medicine. Clinical training for senior veterinary students enrolled in track programs. (S/U grading only.)

273. Equine Practice Clinics (10-15) I, II, III. VMTH Staff (Meagher in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in the School of Veterinary Medicine.

Clinical training for senior veterinary students enrolled in track programs. (S/U grading only.)

274. Food Animal Practice Clinics (10-15) I, II, III. VMTH Staff (Hjerpe in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in the School of Veterinary Medicine. Clinical training for senior veterinary students enrolled in track programs. (S/U grading only.)

275. Zoological Practice Clinics (10-15) I, II, III. VMTH Staff (Fowler in charge)
Veterinary clinical practices—30-45 hours. Prerequisite: fourth-year standing in the School of Veterinary Medicine. Clinical training for senior veterinary students enrolled in track programs. (S/U grading only.)

Veterinary Microbiology

(School of Veterinary Medicine)

Yuan Chung Zee, D.V.M., Ph.D., Chairperson of the Department
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Faculty

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James R. Douglas, Ph.D., Professor Emeritus
Dwight C. Hirsh, D.V.M., Ph.D., Assistant Professor
Michel M. J. Lavoipierre, M.B., Ch.B., Professor
Edmond C. Loomis, Ph.D., Lecturer
Delbert G. McKercher, D.V.M., Ph.D., Professor
John W. Osebold, D.V.M., Ph.D., Professor
Moshe Shifrine, Ph.D., Adjunct Professor
Gerald F. Slonka, D.V.M., Ph.D., Assistant Professor
Jerold H. Theis, D.V.M., Ph.D., Associate Professor (*Medical Microbiology*)
Ming Ming Wong, Ph.D., Lecturer
Yuan Chung Zee, D.V.M., Ph.D., Professor

COURSES IN VETERINARY MICROBIOLOGY

Upper Division Courses

126. Fundamentals of Immunology (2) I. Buchanan, Hirsh
Lecture—2 hours. Prerequisite: general bacteriology; Biochemistry 101A or the equivalent recommended. The immune response and defenses of the host against infection: antibodies, antigens, antibody-antigen interactions, regulation and manipulation of the immune response, hypersensitivity mechanisms and their relationships to disease processes.

126L. Immunology Laboratory (2) II. Buchanan, Hirsh
Laboratory—6 hours. Prerequisite: course 126 (may be taken concurrently), introductory course in microbiology. Laboratory procedures in immunology. The immune response to antigens, antigen-antibody interactions, hypersensitivity mechanisms. Limited enrollment. (P/NP grading only.)

127. Medical Bacteriology and Mycology (3) III. Biberstein, Hirsh
Lecture—3 hours. 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.

NOTE: For key to footnote symbols, see page 132.

Viticulture and Enology

127L. Medical Microbiology Laboratory (3) III. Biberstein, Hirsh
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
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 Human and Animal Parasitology (2) III, Wong
Lecture—2 hours. Prerequisite: Zoology 2. The nomenclature of human and animal parasites, their general morphology, life cycles, epidemiology, diagnostic techniques, and host-parasite relationships.

132L. Laboratory in Human and Animal Parasitology (1) III, Wong
Laboratory—3 hours. Prerequisite: course 132 (may be taken concurrently). Laboratory study to complement course 132, consisting of individual studies supplemented with demonstrations.

198. Directed Group Study (1-5) I, II, III. The Staff (Zee in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Zee in charge)
(P/NP grading only.)

Graduate Courses

270. Advanced Immunology (6) III. Osebold, Buchanan, Shifrine
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 even-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, Hirsh
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, Lavoipierre, Slonka
Seminar—1 hour. A discussion of the current topics in parasitology and entomology.

296. Microbiological Diagnosis (1-5) I, II, III. Biberstein, Hirsh
Laboratory—6-15. 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.

298. Group Study (1-5) I, II, III. The Staff (Zee 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
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Faculty

Curtis J. Alley, Ph.D., Lecturer
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Harold W. Berg, M.S., Professor Emeritus
Roger B. Boulton, Ph.D., Assistant Professor
James A. Cook, Ph.D., Professor
James F. Guymon, Ph.D., Professor
W. Mark Kliever, Ph.D., Lecturer
Ralph E. Kunkee, Ph.D., Professor
Lloyd A. Lider, Ph.D., Professor
Joseph W. Y. Lin, Ph.D., Assistant Professor
(*Viticulture and Enology, Pomology*)
Klayton E. Nelson, Ph.D., Professor
Ann C. Noble, Ph.D., Assistant Professor
Harold P. Olmo, Ph.D., Professor
Cornelius S. Ough, M.S., Professor
Vernon L. Singleton, Ph.D., Professor
Robert J. Weaver, Ph.D., Professor
A. Dinsmoor Webb, Ph.D., Professor
Albert J. Winkler, Ph.D., LL.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, 12L.

COURSES IN VITICULTURE AND ENOLOGY

Lower Division Courses

3. Introduction to Wine Making (3) I, II, III. Singleton, Kunkee
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

105. Systematic Viticulture Including Fruit Maturation and Handling (3) I, Nelson, Olmo
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, Kliever
Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2 or 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. Kliever, Cook
Lecture—2 hours; laboratory—3 hours. 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) II. 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) III. 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.

140. Distilled Beverage Technology (4) I, Guymon
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.

190. Proseminar in Viticulture (1) I, Olmo
Lecture—1 hour. Prerequisite: consent of instructor. Reports and discussions of recent advances in viticulture.

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
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.

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.)

298. Group Study (1-5) I, II, III, The Staff (Webb in charge)

(S/U grading only.)

299. Research (1-12) II, III, The Staff (Webb in charge)

(S/U grading only.)

Water Science

(College of Agricultural and Environmental Sciences)

Faculty. See under the Department of Land, Air and Water Resources (Water Science and Engineering Section).**Related Major Program.** See the major in Soil and Water Science, page 294.**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 101.**Graduate Adviser.** R. H. Burgy.**Related Courses.** See Engineering: Civil 141L, 142, 143, 144, 146, 148A, 148B.

COURSES IN WATER SCIENCE

Questions pertaining to the following courses should be directed to the instructor or to the College Office, 228 Mrak Hall.

Lower Division Courses

2. Introduction to Water Science (4) II, The Staff (T. Hsiao in charge)

Lecture—3 hours; laboratory—3 hours; one all-day field trip. Prerequisite: Chemistry 1A, Physics 2A, and Botany 2; or the equivalent preparation; 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 sample water-resource problems.

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.

40. Ecological Studies of Streams and Ponds (2) I, Knight

Lecture—2 hours. Prerequisite: introductory course in biology. Analysis of water quality problems resulting from multiple use and effects of man's activities on streams and ponds. Multidisciplinary student teams may design and conduct projects leading to alternative approaches.

Upper Division Courses

103. Water Quality, Salt Control and Reclamation (4) I, Biggar

NOTE: For key to footnote symbols, see page 132.

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, T. Hsiao

Lecture—3 hours; discussion—1 hour; two mid-quarter examinations to be arranged. Prerequisite: course 2 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 environs 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) III, Henderson

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.

120. Ecology of Polluted Waters (3) II, Knight

Lecture—3 hours. Prerequisite: Biological Sciences 1 and junior standing. The causes and nature of various types of pollution and their effects upon the aquatic biota. Particular emphasis on biological effects of toxic compounds, inorganic compounds, suspended matter, organic matter, salts and heated water on aquatic life.

140. Groundwater Hydrology (3) II, Luthin

Lecture—3 hours. Prerequisite: course 2, 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. Irrigation and Drainage Management in the Field(6) (Extra Session) The Staff (Robinson in charge)
Lecture—86 hours total; laboratory and field trips—66

hours total. Prerequisite: senior standing in Soil and Water Science or Engineering, or consent of instructor. Discussions, laboratory and field exercises, including assessment of soil and water resources; irrigation methods; soil-plant-water relations; water quality and salinity; drainage; irrigation scheduling; and production economics in irrigated agriculture. Offered in odd-numbered years.

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.

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, (Summer) 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 responses 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 11A; elementary knowledge of metabolism and rudiments of thermodynamics or concurrent enrollment in 1 unit of course 298 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.

202. Evapotranspiration (2) II, Pruitt

Lecture—2 hours. Prerequisite: Atmospheric Science 20 and 20L, or Agricultural Engineering Technology 111, 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, Marino

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) II, Marino

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.

Wildlife and Fisheries Biology

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 (3) III. Knight
Lecture—1 hour; discussion—1 hour; laboratory—3 hours; field trips. Prerequisite: graduate standing; aquatic entomology (or the equivalent), limnology, and phycology. The 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.

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 of 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. Hsiao, Henderson
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. (SU grading only.)

298. Group Study (1-5) I, II, III. (Summer) The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. (Summer) The Staff (Chairperson in charge)
(SU grading only.)

Wildlife and Fisheries Biology

(College of Agricultural and Environmental Sciences)

Dale F. Lott, Ph.D., Chairperson of the Division
Division Office, 192 Briggs Hall (752-0203)

Faculty

Daniel W. Anderson, 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
Hiram W. Li, Ph.D., Assistant Professor
Dale F. Lott, Ph.D., Professor

Rex E. Marsh, A.B., Lecturer
Peter B. Moyle, Ph.D., Assistant Professor
Dennis G. Raveling, Ph.D., Associate 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. Equal or more comprehensive courses are acceptable. Courses shown without parentheses are required.

	UNITS
Preparatory Subject Matter	60
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 1C, 8A, 8B)	21
Mathematics (Mathematics 13, 16A, 16B, 105A)	14
Physics (Physics 2A, 2B, 2C)	9
Zoology (Zoology 2)	6
Depth Subject Matter	24-28
Biochemistry (Biochemistry 101A, 101B)	6
Ecology (Environmental Studies 100 or Entomology 104 or Zoology 125)	3-4
Genetics (Genetics 100A-100B)	6
Physiology (Physiology 110A, 110B or Physiology 101 plus one additional upper division physiology course; Physiology 101L does not satisfy this requirement)	6-7
Zoology (Zoology 105 or 106)	3-5
Breadth Subject Matter	20
English 1 and Rhetoric 1, or equivalents	8
Social science and humanities†	12
Courses in the Major	16
Wildlife and Fisheries Biology 108	4
Upper division courses selected with adviser's approval from: Wildlife and Fisheries Biology 110, 110L, 111, 111L, 120, 121, 122, 135, 135L, 140, 151, 152, 152L, 190, 198, 199	12
Additional courses (select Plan I or Plan II)	15-19
Plan I: Wildlife Biology specialization	
Botany 108	5
Botany 117	4
Wildlife and Fisheries Biology 101	6
Plan II: Fisheries Biology specialization	
Entomology 116	3

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirement.

Environmental Studies 151 or 150C	3-4
Mathematics 19, 105B	6
Wildlife and Fisheries Biology 102	6

Unrestricted Electives **37-45**

Total Units for the Major 180

Major Adviser. P. B. Moyle.

Graduate Study. See page 101.

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. Jacobsen, Cech
Lecture—4 hours. Introduction to the biology and ecology of aquatic and terrestrial wildlife, and basic principles of management.

Upper Division Courses

101. Field Studies in Wildlife Biology (6) (Extra Session—Summer) Raveling, Schwab
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 week 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) Li, Moyle
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.

108. Comparative Nutrition of Wildlife and Fish (4) III. Weir
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B. The principles of nutrition and their application to feeding problems related to wild animals (ruminants and non-ruminants), birds and fish in their natural habitats and in captivity.

110. Biology and Management of Wild Mammals (3) I, Schwab
Lecture—3 hours. Prerequisite: upper division courses in mammalogy, ecology, and physiology; or consent of instructor. Integrated introduction to the biology, ecology, and management of nondomestic mammals. Emphasis is on the natural history, anatomical and physiological adaptations of the species to its environment, species interactions, and economic considerations of selected mammalian groups.

110L. Mammalian Biology Laboratory (1) I, Schwab
Laboratory—3 hours. Prerequisite: concurrent enrollment or previous completion of course 110 or Zoology 136 or consent of instructor. Laboratory in the identification, gross anatomy, behavior, activity patterns, population dynamics, capture-handling-marking methods, research and management techniques, and the natural history of economically important wild mammals.

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 (1) I. Anderson, Raveling
Laboratory—3 hours; field trip(s). Prerequisite: course 111 (may be taken concurrently). Laboratory exercises in bird species identification, anatomy, molts, age and sex differences, specialized adaptations, behavior, and research and management techniques.

120. Biology of Fish (4) I. Moyle
Lecture—3 hours; laboratory—3 hours. Prerequisite: Zoology 2 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. Li
Lecture—3 hours. Prerequisite: upper division ecology courses; Mathematics 13, 16A, 16B. 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.

135. Ecology and Management of Large Mammals (3) III. Jacobsen
Lecture—3 hours. Prerequisite: course 110 or consent of instructor. Emphasis on ecology and management principles of North American ungulates with other selected examples. Includes population dynamics, reproduction, parasites, diseases, and management problems.

135L. Laboratory in Ecology and Management of Large Mammals (1) III. Jacobsen
Laboratory—3 hours. Prerequisite: course 135 (to be taken concurrently). Laboratory and field trips to complement course 135.

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. Behavioral Adaptation in Animals (3) I. Lott
Lecture—3 hours. Prerequisite: Biological Sciences 1 or Zoology 2. The social and individual behavior of animals viewed through the evolution of physiological and experiential mechanisms. Human activities that disrupt some adaptations and favor others will be considered.

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 wildlands; 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.

152L. Principles of Vertebrate Control Laboratory (1) II. Howard
Laboratory—3 hours. Prerequisite: course 152 (concurrently) and consent of instructor; course 151 recommended. Laboratory and field experiences to complement course 152.

NOTE: For key to footnote symbols, see page 132.

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 (Lott 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.)

198. Directed Group Study (1-5) I, II, III. The Staff (Lott in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Lott in charge)
(P/NP grading only.)

Graduate Courses

290. Seminar (3) I, II, III. The Staff (Lott 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, Li
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 (Lott in charge)
Lectures and/or discussions—1-5 hours.

299. Research (1-12) I, II, III. The Staff (Lott in charge)
(S/U grading only.)

Work-Learn Program

(College of Agricultural and Environmental Sciences)

Verne H. Scott, Ph.D., Coordinator/Director of the Program

Bixby Work-Learn Office, Work-Learn Center, 227 South Hall (752-2861)

Faculty

Albert H. Lederer, B.S., Lecturer
Joe J. Stasulat, Ph.D., Lecturer

COURSE IN WORK-LEARN

Questions pertaining to the following course should be directed to the Bixby Work-Learn Office, 223 South Hall.

Upper Division Course

192. Internship (1-15) I, II, III. College of Agricultural and Environmental Sciences Faculty
Laboratory—3-40 hours. Prerequisite: 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. Student transcripts show the field in which an internship is taken. (P/NP grading only.)

Zoology

(College of Letters and Science)

Ronald J. Baskin, Ph.D., Chairperson of the Department
Robert D. Grey, Ph.D., Vice-Chairperson of the Department
Department Office, 2320 Storer Hall

Faculty

Peter B. Armstrong, Ph.D., Associate Professor
Ronald J. Baskin, Ph.D., Professor (Zoology, Physiology)
John H. Crowe, Ph.D., Associate Professor
David W. Deamer, Ph.D., Professor
Robert D. Grey, Ph.D., Associate 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
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., Associate Professor
Herman T. Spieth, Ph.D., Professor Emeritus
Judy Stamps, Ph.D., Assistant Professor
Catherine A. Toft, Ph.D., Acting Assistant Professor
Victor D. Vacquier, Ph.D., Associate 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.

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	40-44
Chemistry 1A, 1B, 8A, 8B	16
Biological Sciences 1	5
Zoology 2	6
Mathematics 13 or 16A-16B	4-6
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	5-6

Zoology

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 27-28

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 76-82

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	6
Mathematics 13	4
Mathematics 16A-16B or 21A-21B	6-8
Physics 2A, 2B, 2C	9
One course from Bacteriology 2, 102, Botany 2	4-5
Recommended: Chemistry 5, Geology 3, Mathematics 16C or 21C	
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	30-31
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.	
Total Units for the Major	100-109

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 68	

College of Letters and Science students

Refer to page 92 for a description of requirements to be completed in addition to the major

Recommended

Chemistry 5, Mathematics 16C or 21C, Geology 3.

Areas of Study

- (1) Ecology and behavior: Zoology 116, 117, 125, 147, 149, 155.
- (2) Systematics, morphology, and natural history: Zoology 105, 106, 112A, 112B, 133, 133L, 136, 137.
- (3) Cell biology: Zoology 121A, 121B, 121L, 166; Botany 130, 130L.
- (4) Developmental biology: Zoology 100, 100L, 102.
- (5) Physiology: Zoology 142, 142L, 143, 166; Physiology 101, 101L.

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. As 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 107 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

Physiology

Lower Division Courses

2. Introductory Physiology (4) I.

Lecture—4 hours. Prerequisite: Biological Sciences 1. Physiology of muscular contraction, nervous integration, sensation, circulation, respiration, excretion, and digestion.

2L. Introductory Physiology Laboratory (2) I.

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.

Zoology

Lower Division Courses

2. General Zoology (6) I, Stamps; II, Phillips; III, Toft
Lecture—3 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1 recommended. Survey of the diversity of animal life and the basic principles of adaptation, evolution, and integration in animals.

33. Seminar in Vertebrate Zoology (2) III. Jameson
Seminar—1½ hours; 2-4 field trips. Prerequisite: a strong interest in vertebrate biology. Open to freshmen and sophomores only. Introduction to some of the basic aspects of the biology of wild vertebrates. Limited enrollment. (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, Vacquier; II, Grey; III, Armstrong
Lecture—4 hours. Prerequisite: Biological Sciences 1; course 2. Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates.

100L. Laboratory in Vertebrate Embryology (2) I, Vacquier; II, Grey; III, Armstrong
Laboratory—6 hours. Prerequisite: course 100 (concur-

rently). Comparative analysis of the embryonic development of vertebrates. Limited enrollment. (P/NP grading only.)

*102. Developmental Biology: Cell Differentiation (4) III. Grey

Lecture—3 hours; term paper. Prerequisite: course 100 and Biochemistry 101B. Current concepts of cell differentiation, principally in animal systems. Topics include properties of major differentiated cell types, and principal mechanisms of control.

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 2000 words, or a dissection with explanation, analyzing the function of a selected aspect of vertebrate structure.

107. Histology (3) II. Crowe

Lecture—3 hours. Prerequisite: course 2, Biological Sciences 1. Functional morphology of animal organs, tissues, and cells, with consideration of both vertebrates and invertebrates. Emphasis is placed on the use of structural studies in elucidating mechanisms underlying physiological and metabolic processes.

107L. Histology Laboratory (2) II. Crowe

Laboratory—6 hours. Prerequisite: course 107 (may be taken concurrently). Laboratory practice in histo- and cyto-techniques and recognition of animal organ, tissue, and cell types; use of anatomical techniques in research.

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. Prerequisite: course 2. Phylogeny, morphology, and embryology of the protozoa, the diploblastic animals, and the deuterostomatous invertebrates.

112B. Invertebrate Zoology (5) III Phillips

Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. 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; Mathematics 13 and 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 (3) I, Deamer

Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B. Structure and function of living systems at the molecular and subcellular level, including molecular organization of membranes, models of membrane structure, photosynthesis and respiration.

121B. Cell Biology (3) II. Wolfe

Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B. Continuation of course 121A. Structure and function of living systems at the molecular and subcellular level, concentrating on synthetic mechanisms in the nucleus and cytoplasm, including cell division.

121L. Cell Biology Laboratory (2) II. Deamer, Wolfe
Laboratory—6 hours. Prerequisite: course 121A and/or
121B recommended. Exercises illustrating the principles of
cell biology; emphasis on individual research employing
one or more advanced techniques.

125. Animal Ecology (3) I. Salt; II. Toft
Lecture—3 hours. Prerequisite: course 2. A general survey
of the concepts of animal ecology.

133. Biology of Cold-Blooded Vertebrates (3) II. Jame-
son
Lecture—3 hours. Prerequisite: course 2. Adaptive and
evolutionary significance of biological patterns of
poikilothermous vertebrates.

**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 (5) III. Rudd
Lecture—2 hours; laboratory—6 hours; weekend field trips.
Prerequisite: course 125 or consent of instructor. Systema-
tics, ecology and life history of mammals with emphasis on
Western North America. Offered in even-numbered years.
Limited enrollment.

137. Ornithology (5) III. Rudd
Lecture—2 hours; laboratory—6 hours; weekend field trips.
Prerequisite: course 125 or consent of instructor. Systema-
tics, ecology and life history of birds with emphasis on
Western North America. Offered in odd-numbered years.
Limited enrollment.

142. Invertebrate Physiology (4) I, Crowe
Lecture—3 hours; term paper; individual conferences. Pre-
requisite: 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) I, Crowe
Laboratory—9 hours. Prerequisite: course 142 (may be
taken concurrently). Experiments on the physiological
mechanisms of invertebrate organ systems.

143. Neurobiology (4) I, Mulloney
Lecture—3 hours; assigned reading. Prerequisite: course
2 or Physiology 2; Biochemistry 101A-101B and Zoology
121A-121B recommended. Neurobiological basis of be-
havior; excitable tissues, signaling in nervous systems,
sensory transduction, and production of ordered move-
ment; organization of vertebrate and invertebrate nervous
systems; synaptic transmission, facilitation and habitua-
tion; embryonic differentiation and regeneration of nervous
systems.

146. Conceptual Problems in the Biological Sciences
(4) I, Shapiro
Lecture—3 hours; term paper. Prerequisite: a major in a
biological science, or one philosophy course. Nature of
theories, explanations and models in biology. Problems in
evolutionary theory and taxonomy. (Same course as
Philosophy 108.)

147. Zoogeography (4) I, Jameson
Lecture—3 hours. Prerequisite: course 2 or Entomology 1.
Movements of terrestrial animals. The role of geologic,
climatic, and biologic changes in the geographic distribu-
tion of animals.

148. Animal Phylogeny and Evolution (5) II, Rudd
Lecture—5 hours. Prerequisite: course 2 or Entomology 1.
Recommended: course 147 and Genetics 100B. The
origins and relationships of the major groups of animals,
with emphasis on the analysis of variation and the
mechanics of evolutionary change.

149. Evolution of Ecological Systems (4) II, Shapiro
Lecture—3 hours; term paper. Prerequisite: course 2 or
Botany 2 or Entomology 100; Genetics 100B recom-
mended. Evolution as an organizing force in natural
communities. Coadaptation in trophic and competitive rela-
tionships. Ecology of polymorphisms, clines, and speciation.

155. Behavior of Animals (4) II, Stamps
Lecture—3 hours; discussion—1 hour. Prerequisite:
course 2. Basic principles, mechanisms and evolution of
behavior, with special reference to the significance of
behavior under natural conditions.

***165. Biology of the Vertebrate Heart** (3) II, Jacobus
Lecture—3 hours. Prerequisite: Biochemistry 101B (may
be taken concurrently). Course integrates the specific sub-
sections of the natural sciences which are related to the
cardiovascular system. Comparative aspects will be stres-
sed. Provides the student with a broad view of modern,
multidiscipline information focused on a dynamic biologi-
cal network.

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 thermo-
dynamics, the ionic basis of excitation, and the molecu-
lar basis of contractility.

***167. Cellular Inheritance** (3) III, Wolfe
Lecture—3 hours. Prerequisite: Genetics 100B and course
in cytology or cell biology. The morphology and replication
of cellular structures with partial or complete genetic au-
tonomy, including chromosomes, mitochondria, chlo-
roplasts, and centrioles. Possible evolutionary origins of
the major cytoplasmic organelles.

197. Senior Colloquium in Zoology (2) III, The Staff
Lecture-discussion—2 hours. Prerequisite: senior stand-
ing. 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 (Chair-
person 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 (Chair-
person 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

201. Advanced Biological Ecology (4) II, Salt, Major,
Valentine
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. (Same course as
Botany 201, Ecology 201, and Geology 201.)

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 descrip-
tion of biological systems; measurement, analysis, simula-
tion 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;
Mathematics 105A-105B or 131A-131B-131C; FORTRAN.
Use of statistical analysis of data, mathematical modelling,
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, Vacquier
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 development 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, Vacquier
Lecture—2 hours; term paper. Prerequisite: course 121A
or the equivalent and consent of instructor. The morphol-
ogy, 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) III, 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, con-
trol of growth of tissue cells (and loss of control in trans-
formed 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. Pre-
requisite: Biochemistry 101A-101B and Mathematics 16B or
21B; or consent of instructor. The physical and chemical
aspects of muscle function.

243. Topics in Cellular and Behavioral Neurobiology
(2) II, 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.)

251. Seminar in Advanced Cytology (2) I, Wolfe
Seminar—2 hours. Prerequisite: consent of instructor. Top-
ics of current interest in the ultrastructure and function of
cells. May be repeated for credit.

266. Seminar in Cell Biology (2) II, Baskin
Seminar—2 hours. Prerequisite: consent of instructor. Dis-
cussion of recent literature on the physical and chemical
aspects of the organization and function of living systems.
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, Vacquier
Seminar—2 hours. Prerequisite: consent of instructor. Pre-
sentation 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. Re-
ports and discussion on the principles and recent de-
velopments in invertebrate and vertebrate animal behavior.

292. Seminar in Development (2) II, Armstrong, Grey,
Vacquier
Seminar—2 hours. Prerequisite: consent of instructor. Re-
ports and discussion on embryology, morphogenesis, and
developmental mechanisms.

293. Seminar in Invertebrate Zoology (2) III, Crowe
Seminar—2 hours. Prerequisite: either course 112A or
112B, or consent of instructor. Critical review of the lit-
erature 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.

296. Seminar in Geographical Ecology (2) I, Shapiro
Seminar—2 hours. Prerequisite: course 125 or 148 or

Zoology

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 (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Baskin in charge)
(S/U grading only.)

Appendix

STATEMENT OF LEGAL RESIDENCE

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 \$635 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.

GENERAL

California residence is established by an adult who has relinquished his or her prior residence and is physically present within the state with the intent to make California the permanent home. California residence must be established more than one year prior to the term for which resident classification is requested. Indicia of California residence include, but are not limited to: registering and voting in California elections; designating California as the permanent address on all school and employment records, including military records if one is in the military service; obtaining a California I.D. card or driver's license; obtaining a California vehicle registration; paying California income taxes as a resident; establishing an abode where one's permanent belongings are kept; licensing for professional practice in California, etc. Conduct inconsistent with the claim of California resi-

dence includes, but is not necessarily limited to: maintaining voter registration and voting in person or by absentee ballot in another state; obtaining a divorce in another state; attending an out-of-state institution as a resident; obtaining a loan requiring residence in another state; maintaining out-of-state driver's license and vehicle registration, etc.

A student who is within California for educational purposes only does not gain the status of resident regardless of the length of his or her stay in California.

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.

EXCEPTIONS

1. A student who remains in this state after his or her parent, who was a resident of California for at least one year prior to leaving but has established residence elsewhere shall be entitled to retain resident classification until one year after the student turns eighteen, thus enabling the student to establish residency, 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. A student who is an adult alien is entitled to resident classification if the student has been lawfully admitted to the United States for permanent residence in accordance with all applicable provisions of the laws of the United States and has thereafter established and maintained residence in California for more than one year immediately prior to the residence determination date.

7. A student who is a minor alien shall be entitled to resident classification if the student and the parent from whom residence is derived have been lawfully admitted to the United States for permanent residence, provided that the parent has had residence in California for more than one year after acquiring a permanent resident visa prior to the residence determination date for the term.

8. 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.

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 as nonresidents and payment of all nonresident fees. If incorrect classification results from false or concealed facts, the student is subject to University discipline and is required to pay all fees he or she would have been charged as a nonresident. 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 authorized 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.

DISCLOSURE OF PUBLIC RECORDS

Public Records (e.g., address, telephone listing, date and place of birth, major field of study, dates of attendance, degrees and honors received, most recent educational institution attended, participation in intercollegiate athletics and the name, weight and height of the participants on intercollegiate University athletic teams) may be released on request unless you specifically indicate on the demographic information forms filled out at the time of registration that such information shall not be disclosed as a matter of public record. Names, however, will be included in directories and listings of students.

The Family Education Rights and Privacy Act of 1974 (Buckley Bill) is a complicated Act but very important for you to understand. The Act assures you access to certain records and outlines your choices in the release of information about you. It is not possible to adequately explain the Act in this publication. The Government Documents Desk and the Reference Room in the Library have copies of the Act. If you have questions about access to, accuracy of, or release of any of the data pertaining to you, please check with the Registrar's Office. While the Act protects your privacy it may also cause some misunderstandings. For example, students who apply to stores or insurance companies for "good" student discounts will have to provide the Registrar with a written release consent statement before your grades, units, or anything else will be provided to support your application. If you want someone or some company (other than on-campus advisers, etc.) to have certain data, you must request that it be released.

**SALARY AND EMPLOYMENT INFORMATION
UNIVERSITY OF CALIFORNIA**

FIELD OF STUDY	DEGREE LEVEL OF GRADUATES			PROBABLE OR DEFINITE JOB COMMITMENT ²
	BACHELOR'S	MASTER'S	DOCTORATE	
	AVERAGE MONTHLY SALARY ¹			
Engineering	\$930-1,290	\$1,030-1,410	\$1,260-1,840	77.4%
Humanities	510- 935	665-1,200	—	59.2
Life Science	545-1,000	—	—	66.0
Management	—	1,100-1,545	—	80.7
Physical Science	760-1,260	—	1,280-1,720	70.5
Social Science	560- 975	730-1,180	—	56.6

¹Source: A national survey of a representative group of colleges conducted by the College Placement Council, representing the 80 percent range of offers throughout the country. 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.

²Source: *The Job Market for UCLA's 1974 Graduates*. Percentages are based only upon those students who planned to work immediately after graduation.

PUBLICATIONS

General Catalog, UC/Davis

Contains complete information about academic programs on the Davis campus—admission requirements, curricula, course descriptions, degrees offered, regulations and requirements for degrees, financial aid for students, the academic calendar, student activities, and general campus information.

Office of the Registrar. (Price \$1.50 if purchased directly at the UCD Bookstore; \$2.00 by mail from the Office of the Registrar with checks made payable to The Regents of the University of California.)

Undergraduate Admissions Circular

A complete statement of the University's requirements for admission as an undergraduate.

Office of 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.)

Announcement of the Graduate Division, UC/Davis

A brief description of the graduate program, including procedures and dates for filing applications, degrees offered, fields of study, fees and expenses, financial aid, living accommodations, 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.)

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 free at the UCD Bookstore and the Registrar's Office (in person only).

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, work-study. Budget information.

Financial Aid Office, North Hall. (No charge.)

Student Viewpoint

Student-compiled evaluations of courses and professors by in-class surveys.

UCD Bookstore. (Not 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 at 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 the 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 a student wants to drop, change, or add a course.
- 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 is considered a student in good standing.
- Grade-point average (GPA)** The GPA is computed in the following manner. You receive a certain amount 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 amount 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.
- 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 Medicine, Veterinary Medicine, or Law.

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 quarters.

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, check out library books, 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.

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. Residence can be 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. Also refers to the non-credit course which fulfills this requirement for those students who have not satis-

fied the Subject A requirement by another method.

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* 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 combining classroom work and 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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Index

Absence

- leave of, 52
- planned leave of, 52
- (see also Withdrawal)
- Academic Senate, 11
- Administration, University, 11
- Administrative Officers, 11, 318-19
- Admission
 - application
 - procedures, 47
 - deadlines, 9, 21, 47
 - by examination, 44
 - categories (student), 41-42
 - change of campus, 41, 48
 - checklist, 49
 - college, choice of, 42
 - Educational Opportunity Program, 41, 45
 - eligibility, notification of, 42
 - failure to register, 48
 - in advanced undergraduate standing, 41, 44
 - in freshman standing, 41, 42
 - in graduate standing, 42, 104
 - in limited status, 42, 46
 - in part-time status, 20, 42
 - in special status, 42, 46
 - Intention to Register, Statement of, 48
 - intercampus transfer, 41, 46
 - of applicants for second bachelor's degree, 42, 45
 - of applicants from other countries, 42, 46
 - of out-of-state applicants, 45
 - preparatory high school subjects, 43
 - reapplication, 47
 - requirements at entrance, 42-45
 - credit toward, 44, 49
 - examinations, 43, 48, 49
 - for a College, 64, 71, 87
 - for graduate study, 103
 - for preprofessional study, 109, 115, 121, 125
 - for Law, School of, 115
 - for Medicine, School of, 121
 - for Veterinary Medicine, School of, 125
 - transcript of record for, 47
 - visit to campus, 41, 64
- Advising
 - Academic Advising Intern Program (AAIP), 28
 - and counseling, 28-30
 - College of
 - Agricultural and Environmental Sciences, 64

- Engineering, 72
- Letters and Science, 88
- Educational Opportunity Program (EOP), 30
- faculty, 51, 64, 72, 88, (see under specific major program)
- First Resort, The, 28, 29, 65
- international student, 31
- orientation and summer, 29, 51
- peer, 28, 29, 65, 72, 88
- preprofessional, 28, 88, 110, 111
- Services (student), 28-29
- Summer Program (SAP), 28, 29, 51, 72, 88
- Aeronautical Engineering (see Engineering)
- Afro-American Studies
 - course in, 133
 - Program in (Afro-American and Black Studies), 133
 - (see also Black Studies)
- Agrarian Studies
 - courses in, 134
 - major in, 66, 133
- Agricultural and Environmental Sciences, College of, 63-69
 - advising, 64
 - expanded course descriptions, 65
 - honors and prizes, 69
 - majors and special programs, 66
 - orientation, 65
 - passed/not passed option, 68
 - probation, 68
 - program planning, 64
 - requirements (college), 68
 - scholarship, 61, 69
 - scholarships, 69
 - services (student), 64
 - study-list requirements, 68
 - teaching credentials, 67, 134, 137, 148
 - transfer students, 68
 - work-learn, 65, 133, 307
- and Home Economics Education, courses in, 134
- Business Management, option, 137
- Chemistry
 - courses in, 135
 - graduate group, 103, 134
- Economics
 - and Business Management, major in, 66, 137
 - courses in, 135
 - Department of, 135
 - related major, 137

- Education
 - major in, 66, 137
 - (see also Agricultural and Home Economics Education)
- Engineering
 - courses in (see Agricultural Engineering Technology; Consumer Technology; Engineering: Agricultural)
 - major in (see Engineering: Agricultural Technology, courses in, 138)
 - genetics (see Genetics)
 - Practices
 - course in, 139
 - (see also Agrarian Studies; Work-Learn)
 - Science and Management
 - courses in, 139
 - major in, 66, 139
- Agronomy
 - and Range Science, Department of, 140
 - courses in, 139, (see also Range Management)
 - related majors, 66, 139
 - (see also Plant Science)
- Allied Health Sciences, preprofessional requirements, 111-13
- Alumni Association, 33
- American
 - History and Institutions requirement, 60-61, 175, 226, 261, 277
 - Studies Program, 140
 - courses in, 141
 - major in, 140
- Anatomy
 - courses in, 142, (see also Human Anatomy)
 - Department of, 142
 - graduate group, 103
- Anesthesiology, courses in, 248
- Animal
 - biochemistry (see Biochemistry)
 - Genetics, courses in, 142
 - husbandry (see Animal Science)
 - nutrition (see Animal Science; Nutrition)
 - Physiology
 - Department of, 143
 - courses in, (see Physiology)
 - Science
 - courses in, 143
 - Department of, 143
 - major in, 66, 143
 - (see also Agricultural Science and Management)
- Anthropology, Department of, 144

- courses in, 145
- major programs, 144-145
- (see also Oriental Languages)
- Applications
 - graduate, 104
 - Law School, 115-16
 - Medicine, School of, 122
 - undergraduate, 47
 - Veterinary Medicine, School of, 126
- Applied
 - Behavioral Sciences, Department of, 147
 - courses in, 148
 - major in, 66, 148
 - Science (see Engineering)
- Arboretum, University, 19
- Archaeology, courses in (see Anthropology)
- Architecture
 - courses in, 150, 151
 - Landscape option, 204-205
- Art
 - Conservation Laboratory, 17
 - courses in, 150, (see also Design)
 - Department of, 149
 - majors in, 149
- Arts and Lectures, Committee for, 21
- Asian American Studies, courses in, 152
- Assistantships, teaching and research, 36, 106
- Associated Students (ASUCD), 27-28
- Astronomy, courses in, 270
- Athletics (see Physical Education)
- Atmospheric Science
 - courses in, 153
 - graduate group, 103
 - major in, 66, 152
 - Section (Land, Air and Water Resources), 235
- Attorney in Residence Matters, 311
- Autotutorial courses, defined, 130
- Avian
 - Medicine (see Epidemiology and Preventive Medicine)
 - Sciences
 - courses in, 154
 - Department of, 153
 - graduate group, 103
 - major in, 66, 154
- B**achelor's degree (see Degree Requirements)
- Bacteriology, Department of, 155
 - courses in, 155
 - majors in, 66, 155
- Bee biology (see Entomology)
- Behavioral Biology, courses in, 248
- Biochemistry
 - and Biophysics
 - courses in, 157
 - Department of, 157
 - courses in, 157
 - graduate group, 103, 157
 - major in, 66, 156
- Biological
 - Chemistry, courses in, 248
 - control (see Entomology)
 - Sciences (Intercollege Division)
 - courses in, 159
 - majors in, 66, 158
- Biology (see Biological Sciences)
- Biomedical Engineering
 - courses in, 159
 - graduate group, 103, 159
 - specialization in, 82
- Biophysics
 - graduate group, 103
 - (see Biochemistry and Biophysics)
- Black Studies
 - courses in, 133
 - major in, 133
 - program in (Afro-American and Black Studies), 133
- Botany
 - courses in, 160
 - Department of, 159
 - graduate group, 103
 - majors in, 66, 159
- Brewing technology (see Fermentation Science; Food Science)
- Buckley Act, 313
- Business
 - administration, preprofessional requirements, 110
 - management (see Management)
 - (see also Agricultural Economics and Business Management; Economics)
- C**alendar, 8-9, (Law School), 118
- Campuses, University, 11
- Campus tours, 21, 41
- Candidacy for degrees, filing
 - announcement
 - undergraduates, 8, 61
 - graduate students, 9
- Cantonese, courses in (see Asian American Studies)
- Cardiology, courses in, 251
- Carnegie Institute (Davis Division), 17
- Change of
 - campus before registration, 48
 - college, school, or major, 52, 91
 - grade, 55
 - name, 52
- Chemical Engineering (see Engineering)
- Chemistry
 - Agricultural, graduate group, 103, 134
 - applied, specialization in, 79
 - Biological, courses in, 248
 - courses in, 162
 - Department of, 162
 - majors in, 162
- Chicano Studies, course in, 258
- Child Development
 - graduate group, 103
 - (see also Human Development)
- Chinese (see Oriental Languages)
- City Planning, (see Environmental Planning and Management)
- Civil Engineering (see Engineering)
- Class level, 56
- Classics, courses in, 164
- Clinical
 - Pathology
 - courses in, 165
 - Department of, 165
 - Psychology, courses in, 249
- Community
 - Development
 - Research Service, 17
 - (see also Applied Behavioral Sciences; Home Economics)
 - Health, courses in, 249
 - Nutrition, major in, 66, 166
- Comparative
 - biochemistry (see Biochemistry graduate group)
 - Literature Program, 166
 - courses in, 167
 - major in, 166
- Pathology, graduate group, 103
- Computer
 - Center, 17
 - Science
 - option, 82, 183
 - graduate group, 103
- Concurrent courses, defined, 42, 47, 131
- Conduct and discipline, 59
- Conservation, 287, 294, 306
- Consumer
 - Economics
 - courses in, 168
 - (see Development, Resource, and Consumer Economics)
 - Food Science, major in, 66, 168
 - Science
 - courses in, 169
 - graduate group, 103
 - related major, 168
 - Technology, courses in, 169
- Counseling Center, 29
- Courses
 - adding and dropping, 52
 - classification and numbering, 129-31
 - expanded descriptions of, 65, 74, 129
 - prerequisites, 129
 - repetition of, 56
 - (see also Credit; Units of Credit)
- Credentials (see Teacher Education)
- Credit
 - advanced (credit) allowed, 58
 - and scholarship, 53
 - by examination, 56
 - for repetition of course, 56
 - for work taken in other institutions, 49
 - in extension courses, 74, 95, 131
 - in professional courses, 95, 130
 - in Summer Session courses, 61, 131
 - (see also Units of Credit)
 - value of courses, defined, 129
- Criminal Justice
 - Center on Administration of, 17
 - option in, 292
- Crocker Nuclear Laboratory, 18
- D**avis, campus and community, 11-15
- Deficiencies
 - disciplinary action, 57
 - of transfer students, 44
 - removal of grade, 55

- Degree requirements**
 advanced, 105
Bachelor of Arts
 for Letters and Science, College of, 92-93
 (see also under specific majors)
Bachelor of Science
 for Colleges, 68, 74-76, 92-93
 for Veterinary Medicine, School of, 126
 (see also under specific majors)
 Part-Time Program, 20
 filing candidacy, 8-9, 61
 second baccalaureate, 42, 45
 units, 61
 University, 60-61
- Design**
 courses in, 170
 major in, 66, 170
 specializations in, 82, 84
- Development, Resource and Consumer Economics**, major in, 66, 171
- Dietetics**
 major in, 66, 171
 related fields, 66
- Disqualification for scholastic deficiency**, 51, 57
- Directory for correspondence** (inside back cover)
- Division of Extended Learning** (see Extended Learning)
- Dramatic Art, Department of, 172**
 Artists in Residence Program, 172
 courses in, 172
 major in, 172
 University theatre, 172
- East Asian Studies Program**, major in, 174
- Ecology**
 courses in, 174
 graduate group, 103, 174
 Institute of, 18
- Economics**
 courses in, 175
 Department of, 175
 major in, 175
 (see also Agricultural Economics; Consumer Economics)
- Education**
 Abroad Program (EAP), 22, 179
 Agricultural, major in, 137
 courses in, 177
 Department of, 177
 (see also Agricultural and Home Economics Education; Applied Behavioral Science)
- Educational**
 Opportunity Program, 30, 41, 45
 Placement Service, 33
- Electrical Engineering** (see Engineering)
- Eligibility for admission, notification of, 48**
- Employment**
 career, 22, 33
 information, 314
 student, 32, 36
- Endocrinology**
 course in, 252
 graduate group, 103
- Engineering**
 Aeronautical
 major in, 76, 182
 specializations in, 76
 Agricultural, Department of, 185
 courses in, 186
 major in, 77, 182
 specializations in, 77
 Applied Science, Department of, 186
 courses in (Davis and Livermore), 187
 graduate study, 85
 Biomedical (see Biomedical Engineering)
 Chemical, Department of, 189
 courses in, 189
 major in, 78, 183
 lower division program, 181
 specializations in, 78
 Civil, Department of, 189
 courses in, 190
 major in, 80, 183
 specializations in, 80
 College of, 71-85, 181
 admission and requirements, 71-72
 advanced standing, 72
 advising, 72
 breadth requirements, 75
 core courses, 184
 double majors in, 73, 182-84
 electives, 75-76
 graduate study, 85
 honors, 59
 lower division programs, 181-82
 major and program planning, 72-74
 passed/not passed option, 76
 requirements (college), 74
 residence, 75
 scholarship, 73
 senior degree check, 74
 study-list regulations, 73
 Work-Learn, 74
 Electrical, Department of, 192
 courses in, 193
 major in, 81, 183
 specializations in, 82
 Material Science and
 double majors, 73, 182-84
 major in, 82, 183
 Mechanical, Department of, 195
 courses in, 195
 major in, 84, 184
 specializations in, 84
- English**
 courses in, 198
 Department of, 197
 major in, 197
 requirements
 for admission to University, 43
 for international students, 46, 60, 104
 for Colleges, 68, 72, 87
 (see also Subject A)
- Enology** (see Viticulture and Enology)
- Enrollment**
 dates for, 8, 118 (Law School)
 Davis campus, 11
- Entomology, Department of, 201**
 courses in, 202
 major in, 66, 202
- Environmental**
 Education (see Environmental Planning and Management; Renewable Natural Resources)
 Horticulture, Department of, 203
 courses in, 203
 related majors, 66, 203
 Planning and Management
 courses in, 205
 major in, 66, 204
 Studies (Intercollege Division), 206
 courses in, 206
 program of study, 206
 Toxicology, Department of, 208
 courses in, 208
 major in, 66, 208
- Epidemiology and Preventive Medicine**
 courses in, 209
 Department of, 209
- Examinations**
 advanced placement (CEEB), 43, 49, 58
 American History and Institutions, 60
 credit by, 56
 English Composition, 92, 95
 entrance, 43, 49
 final, 56, 97-98
 high school proficiency, 48
 foreign language placement, 58, 96
 in English for international students, 46, 60, 104
 Law School admission, 116
 Medical School admission, 121
 physical (see physical examination)
 reexaminations, 55
 regulations concerning, 56
 Subject A English Composition, 60
 Exchange Program, Intercampus, 106
- Expenses, student** (see Fees)
- Exploratory program**, 66, 67
- Extended Learning, Division of, 20-21**
 Arts and Lectures, 21
 Conferences and Campus Services, 21
 Part-Time Degree Program, 20
 Summer Sessions, 21
 University employees, 20
 University Extension, 21
- Extension**
 courses, defined, 131
 University, 21
- Extra-session courses**, defined, 131
- Facility for Advanced Instrumentation**, 18
- Family Practice**, courses in, 250
- Farm management** (see Agricultural Economics)
- Fees and deposits, 35**
 application for admission, 46, 47
 education, 35
 50 Reduced Fee Program, 20, 52
 intention to register, 48
 late registration, 35, 51
 Memorial Union, 35, 36
 nonresident tuition, 35, 36, 311
 parking, 35
 part-time student, 20
 Planned Educational Leave Program, 53

readmission applications, 35
 reapplication, 47
 refunds, 53
 registration, University, 35, 48
 residence hall contract, 25
 student body membership, 27, 35, 36
 transcript of record, 35, 56
 Fellowships, 36, 106
 Fermentation Science, major in, 66, 210
 Financial aid, 36-39
 application for, 36
 international students, 46
 Fine Arts and Museology, Laboratory for, 149
 First Resort, The, 28, 29, 65
 Fish and game management, 306
 Floriculture (see Plant Science)
 Food
 Biochemistry, major in, 66, 211
 processing
 specializations in, 77, 79
 (see also Fermentation Science; Food Science)
 Protection and Toxicology Center, 18
 Science
 and Technology, Department of and
 courses in, 211-12
 graduate group, 103
 major in, 66, 211
 Service Management
 courses in, 213
 major in (Dietetics), 213
 Foreign
 language-
 admission requirements, 43
 advanced placement in, 58, 96
 Letters and Science College
 requirements, 93, 96
 professional courses for teachers (see
 under specific language)
 (see under specific language)
 literature in translation, 213
 students (see international students)
 Forest engineering, 73, 78, 182
 Forestry (see Preforestry)
 French (and Italian), Department of, 214
 courses in, 214
 major in, 214
 Freshman standing, 41

Genetics
 Animal (see Animal Genetics)
 courses in, 217
 Department of, 217
 graduate group, 103
 major in, 66, 217
 plant, courses in (see Agronomy)
 Geography, Department of, 218
 courses in, 218
 major in, 218
 Geology, Department of, 220
 courses in, 220
 major in, 220
 German (and Russian), Department of, 222
 courses in, 223
 major in, 223

Glossary, 316-17
 Governmental Affairs, Institute of, 18
 Grade points
 computation of (grade-point) average, 54
 deficiency, 57
 defined, 54
 Grading
 change of, 55
 defined, 54
 incompletes, 55
 in-progress (deferred), 55
 mid-term, 56, 97
 passed/not passed, 54, 55, 98
 passed/not passed option, 54, 68, 76, 92, 98
 removal of deficiency, 55
 satisfactory/unsatisfactory, 54
 unofficial grades available, 56
 Graduate
 admission
 applications and requirements, 103-104
 for international students, 104
 reentry, 104
 with degree objective, 105
 degrees
 list of, 101-102
 requirements for, 105
 Part-Time Program, 20
 Division, The, 101-107
 fellowships, assistantships, and loans, 36, 106
 groups, list of, 103
 intercampus exchange program, 106
 part-time students, 20
 program of study, 106
 student scholarship deficiencies, 57
 study in Engineering, 85
 teacher credential program, 107
 Grants, 36-38
 Greek (Spanish and Classics, Department of), 164
 courses in, 165
 major in, 164
 Gymnasium, use of, 268

Handicapped Students, Services to, 31
 Health
 evaluation, 30, 51
 insurance plan, 31
 Sciences, Allied, 111
 Service, Student, 30
 Hebrew, courses in, 287
 Hematology-Oncology, courses in, 252
 History
 and government of University, 11-13
 courses in, 226
 Department of, 225
 major in, 225
 of the Davis campus, 12
 requirement for admission, 43
 Home
 Economics
 major in, 66, 230
 education (see Agricultural and Home Economics Education)
 Management (see Consumer Science)

Honors
 at graduation, 59, 69
 courses, defined, 130
 deans list, 59, 69
 in Colleges, 59, 69, 97
 prizes and awards, 59-60
 Horticulture
 graduate group, 103
 (see Environmental)
 Housing
 on-campus and off-campus, 25
 married student, 25
 room and board, 25, 36
 Human
 Anatomy, courses in, 250
 Development
 (child), major in, 66, 230
 courses in, 230
 Physiology, courses in, 251
 Humanities
 advanced credit allowed, 58
 Letters and Science list of courses, 94
 major in, 231
 Program in, 231
 requirements in Colleges, 68, 75, 93

Independent Study Program, 8, 131
 Individual major (see Majors)
 Infectious Diseases, courses in, 252
 Integrated Studies
 courses in, 232
 Program in, 232
 Intercampus
 exchange program, graduate students, 106
 transfer, 41, 46, 48
 Interdepartmental majors (see Majors)
 Interior decoration (see Design)
 Internal Medicine, courses in, 251-52
 International
 Agricultural Development
 courses in, 233
 graduate group, 103
 major in, 66, 232
 Relations Program, major in, 233
 students
 admission, 46, 104
 advising and services, 31
 American History and Institutions
 requirement, 61
 courses in English for, 60, 198
 examination in English for, 46, 60, 104
 financial aid, undergraduate, 46
 rules governing residence, 311
 scholarship, 45, 46
 Irrigation (see Engineering: Civil; Soil and Water Science)
 Italian (French and Italian, Department of), 234
 courses in, 234
 major in, 234

Japanese (see Oriental Languages)

Laboratory
 science requirement for admission, 43

technician (see various natural sciences)
Land, Air and Water Resources, Department of, 235

Landscape
architecture, 204
horticulture, 276
management, 204

Late registration and filing, 35, 51

Latin
courses in, 165
major in, 164

Law, School of, 115-19, 235-39
admission to, 115-17
applications, 119
calendar (semester), 118
courses in, 235
degree programs, 118-19
preprofessional requirements, 110, 115
residence rules, 61
student assistance program, 29, 110

Learning Assistance Center, 30

Leave of absence, 52

Letters and Science, College of, 87-99
advising, 88
advanced placement examinations, 58, 96-97

change of major, 91
credit in special courses, 95
declaration of major, 89
final examinations, 97-98
honors and awards, 97
major programs, list of, 89-90
passed/not passed option, 92, 98
preprofessional advising, 88
requirements

breadth, 93, 94, 96
College, 92-93
English composition, 58, 92, 95
major (see *under* specific major)
residence, 93
scholarship, 91, 93
study-list, 99
unit limitations, 92, 98
senior degree check, 98
student services, 87
teaching departments, 89

Liberal Arts Program, major in, 239

Library, University, 16

Limited status (see admission)

Linguistics
courses in, 240
graduate group, 103
major in, 239
Program in, 239

Living accommodations, 25

Loans, 33, 36-38, 106

Majors

change of, 52, 91
cross-college, 66, 73, 90
declaration of (Letters and Science), 89, 93
individual, 66, 67, 73, 90
requirements (see *under* specific major)

Management

Agricultural Science and, 66, 139

business, 66, 137, 175
Food Service, 171, 213
food technology and, 171
home, 168
landscape, 204

Mandarin (see Oriental Languages)

Marketing (see Agricultural Economics and Business Management; Food Science)

Marine

Laboratory (Bodega), 17
Resources, Institute of, 19

Mass Communication Program, major in, 240-41

Materials Science and Engineering (see Engineering)

Mathematics

courses in, 242
Department of, 241
majors in, 241
requirement for admission, 43
requirement for (Engineering), 75, (Letters and Science), 93

Meat technology (see Food Science)

Mechanical Engineering (see Engineering)

Medical

evaluation and examination, 30, 51
Learning Resources, courses in, 252
Microbiology, courses in, 252

Medicine

courses in (Veterinary Medicine), 256
Department of (Veterinary Medicine), 256
School of, 121-23, 245-56
admission to, 121
courses in, 248-56
health professions student assistance program, 28, 110
preprofessional requirements, 110, 122
transfer with advanced standing, 121

Medieval Studies Program, 257

courses in, 257

major in, 257

Memorial Union

Complex, 27

fee, 35, 36

Merchandising, 137, 171, 299

Meteorology, 152, 153

Mexican-American (Chicano) Studies

course in (Chicano Studies), 258

major in, 257

Program in, 257

Microbiology

courses in, 252, 258, 303

graduate group, 103, 258

Medical, courses in, 252

Veterinary (see Veterinary Microbiology)

Military Science, Department of, 258

Army ROTC training, 258

courses in, 259

credit in, 258-59

programs in, 258

scholarships, 39, 258

Molecular biology, 158, (see *also*

Biochemistry; Genetics)

Music, Department of, 259

courses in, 259

major in, 259

Name change, 52

Native American Studies

courses in, 261

major in, 261

Natural sciences

advanced credit allowed, 58

requirements for (Agricultural and Environmental Sciences), 68; (Letters and Science), 93, 95

Nematology

courses in, 262

Division of, 262

related fields (see Environmental Toxicology; Plant Science)

Neurology, courses in, 253

Neurosurgery, courses in, 253

Nonresident student

admission requirements, 45, 46, 104

rules governing residence, 311

tuition fee, 35

Nursery

production and management, 276

school education (see Human Development)

Nutrition

Community, major in, 66, 166

courses in, 252 (medicine), 263

Department of, 263

graduate group, 103

related majors (see Animal Science; Dietetics)

Science, major in, 66, 263

Oriental Languages, courses in, 264

Orientation

course in, 65, 265

in Agricultural and Environmental Sciences College, 65

Week, 51

Summer, 51

Ornamental Horticulture, 276

Orthopaedic Surgery, course in, 253

Otorhinolaryngology, courses in, 253

Out-of-state applicants (see Nonresident student)

Park and recreation administration, 204

Parking fee, 35

Part-Time Degree Program, 20

Passed/not passed (see Grading)

Pathology

Clinical (see Clinical Pathology)

courses in, 253 (medicine), 265 (veterinary medicine)

Department of (Veterinary Medicine), 265

Pediatrics, courses in, 254

Petitions, change, 52, 91

Pharmacology

and Toxicology, graduate group, 103, 266

courses in, 254

Philosophy, Department of, 266

courses in, 266

major in, 266

Physical

Education, Department of, 267

- courses in, 268
- intercollegiate athletics, 51
- major in, 268
- evaluation and examination, 30, 51
- Medicine and Rehabilitation, courses in, 255
- Sciences Program, major in, 269
- Physics, Department of, 270
 - courses in, 270
 - majors in, 270
- Physiological Sciences
 - courses in, 272
 - Department of, 272
- Physiology
 - Animal, Department of, 143
 - courses in, 273, 276, 308
 - graduate group, 103
 - major in, 66, 273
 - related field (see Animal Science)
- Placement services (see Employment)
- Planned Educational Leave Program, 52
- Plant
 - and Pest Management, graduate group, 103
- Pathology,
 - courses in, 275
 - Department of, 275
 - related fields (see Environmental Toxicology; Plant Science)
- Physiology
 - courses in, 276
 - graduate group, 103, 276
 - protection (see Environmental Toxicology)
- Science
 - courses in, 276
 - major in, 66, 276
 - related courses, 139, 203, 275, 281, 286, 300, 304
 - specialization in, 139
- Political Science, Department of, 277
 - courses in, 278
 - majors in, 277
- Pomology
 - courses in, 281
 - Department of, 281
 - related major (see Plant Science)
- Portuguese, courses in, 296
- Poultry husbandry (see Avian Sciences)
- Preforestry, non-degree program, 66, 67, 110, 282
- Preprofessional
 - advising, 28, 88, 110
 - curricula, 67, 88, 109-113, 115, 122, 125, 282, 292
- Prerequisites, course, 129
- Preventive Veterinary Medicine
 - graduate group, 103
 - master's degree in, 127
- Primate Research Center, California, 17
- Prizes and awards, 59-60
- Probation, 57, 68
- PROBE (see Work-Learn)
- Professional
 - courses, defined, 130
 - schools
 - reference material, 29, 113
 - requirements, 109-113
- (see also Law, Medicine, Preprofessional, Veterinary Medicine)
- Psychiatry, courses in, 255
- Psychology, Department of, 282
 - courses in, 283
 - majors in, 282
- Public
 - health
 - related fields (see Consumer Food Science; Dietetics; Epidemiology)
 - records, disclosure of, 313
- Publications, 28, 315

- Quantitative biology** (see Biochemistry; Nutrition Science; Physiology)
- Quarters
 - explanatory note, 129
 - how to convert units, 53

- Radiobiology Laboratory**, 19
- Radiological Sciences (Veterinary Medicine)
 - courses in, 285
 - Department of, 284
- Radiology, courses in, 255-56
- Ranching, 285
- Range
 - and Wildlands Science, major in, 66, 285
- Management
 - courses in, 286
 - graduate group, 103
 - related major, 285
 - science (see Agronomy)
- Readmission
 - after an absence, 52, 104
 - after disqualification, 57
 - application deadlines, 9, 52
 - health requirement, 30
- Recreation, 26-27
- Registration
 - and Summer Advising Conference, 51
 - intention to register form, 48
 - in variable-unit courses, 130
 - procedures, 51-53
 - reduced fee program, 20, 52
- Religious Studies Program, 286
 - courses in, 286
 - major in, 286
- Renewable Natural Resources, major in, 66, 287
- Reproduction (Veterinary Medicine)
 - courses in, 288
 - Department of, 288
- Requirements
 - advanced degree, 101
 - breadth (College), 68, 75, 93
 - degree (see Degree Requirements)
 - for admission, 42-45
 - for graduation, 60-61
 - minimum scholastic, 53, 57
 - (see also Preprofessional; specific Major Program)
- Research
 - assistantships, 106
 - facilities, 17-19, 32

- Residence
 - requirement for graduation, 61
 - requirement for Engineering, 75
 - requirement for Letters and Science, 93
 - rules governing, 311-12
 - Statement of, 51, 311
- Resource Sciences and Engineering, 66
 - courses in, 288
 - related major, 287
- Rhetoric, Department of, 288
 - courses in, 289
 - major in, 288
- Rheumatology, courses in, 252
- Russian
 - courses in, 290
 - Department of (German and Russian), 290
 - Literature and History Program, major in, 291
 - major in, 290

- Satisfactory/Unsatisfactory** (see Grading)
- Scholarship
 - deficiencies, 57
 - honors and prizes, 59
 - requirement, 53
 - requirements for admission, 43, 44, 45, 46
 - requirements for graduation, 61, 69, 73, 93
- Scholarships, 36, 38-39
 - Alumni, 33, 39
 - California State, 37
 - in Agricultural and Environmental Sciences College, 69
 - private donors and agencies, 39
 - Regents' and President's, 39
 - ROTC Army program, 39, 258
- Second baccalaureate, 42, 45
- Selective Service, 32
- Social
 - Sciences
 - requirements for Colleges, 68, 75, 93
 - list of courses (Letters and Science), 94
 - Welfare, option in, 292
- Sociology, Department of, 292
 - courses in, 292
 - major in, 292
- Soil
 - and Water Science
 - courses in (see Soil Science; Water Science)
 - major in, 66, 294
 - Science
 - courses in, 295
 - graduate group, 103
 - related major, 294
- Soils and Plant Nutrition
 - related fields, 285, 294
 - Section (Land, Air and Water Resources), 235
- Spanish (and Classics), Department of, 296
 - courses in, 296
 - major in, 296
- Special Study courses, defined, 130
- Speech (see Rhetoric)
- Student
 - activities, 26-29, (see also Campus Tours)

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