UC/DAVIS

General Catalog

1984-85

HOW TO USE THIS CATALOG

We intend the *UC Davis General Catalog* as a source of information about the Davis campus course offerings, academic programs, campus facilities, services, fees, requirements, and campus life. We know that it is used for a variety of ends and purposes by both current and prospective students and their advisers. While we attempt to provide information for all of these uses, you may find that some information you need is not given. Therefore, throughout the book, we refer to other publications available from individual offices or departments. In the Correspondence Directory on page 330 you will find a list of the most frequently questioned offices and their addresses. (Please refer to the Index for locations of other offices or department addresses.) On page 329 there is a list of major publications and where you can request them.

The *Catalog* is divided into four major sections:

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

If you are a prospective student, the first section of the catalog will answer your questions about the Davis campus—what it's like and what makes it special. You should supplement this impression by reading, in the second section, the description of the college or school which interests you. Section three is intended to answer the question, "What does UCD offer to help me reach my goals?" If you are a prospective freshman or international student, you may find it helpful to look over the glossary of unfamiliar terms on page 331. The names of some majors may not convey to you what academic areas courses cover, so check the lists of courses offered to satisfy the requirements of any unfamiliar major. Department chairpersons, program directors, major advisers, or any faculty member listed with these major offerings would be happy to answer any further questions you might have.

Prospective graduate students might also wish to send for the *Announcement of the Graduate Division* (Graduate Division Office, 252 Mrak Hall) which provides descriptions of graduate programs and requirements (but no course listings).

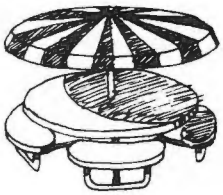
Current students should refer to the *Catalog* throughout their years here to answer specific questions on regulations, requirements, and course offerings. Although every effort is made to keep the *Catalog* correct and current, inevitably there will be some changes in courses offered or instructors assigned. You should, therefore, check the quarterly *Class Schedule and Room Directory* for the up-to-date list of courses offered.

Advisers of prospective students may wish to send for the *Planning Guide to Majors,* distributed by the Office of Relations with Schools (11 Mrak Hall), for more comprehensive information on programs and their requirements.

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

UC/DAVIS

General Catalog
1984-85



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

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

Price $1.50. Cost by mail (includes price of catalog): $5.00 First Class; $4.00 Second Class; overseas: $11.50 Air Mail; $7.00 surface mail from the Office of the Registrar. (Make checks payable to: The Regents of the University of California.)

COMPLIANCE STATEMENTS

Privacy Act. A student's Social Security number is used to verify personal identity in the UCD Student Records System. In accordance with the Federal Privacy Act of 1974, students are hereby notified that disclosure of their social security number is mandatory. This record-keeping system was established prior to January 1, 1975 pursuant to the authority of The Regents of the University of California under Art. IX, Sec. 9, of the California Constitution.

Nondiscrimination. The University of California, in compliance with Titles VI and VII of the Civil Rights Act of 1964, Title IX of the Education Amendments of 1972, and Sections 503 and 504 of the Rehabilitation Act of 1973, the Age Discrimination in Employment Act of 1967, and the Age Discrimination Act of 1975, does not discriminate on the basis of race, color, national origin, religion, sex, handicap, or age in any of its policies, procedures, or practices; nor does the University, in compliance with Section 402 of the Vietnam Era Veterans Readjustment Act of 1974, and Section 12940 of the State of California Government Code, discriminate against any employees or applicants for employment because they are disabled veterans or veterans of the Vietnam era, or because of their medical condition (as defined in Section 12926 of the California Government Code), their ancestry, or their marital status; nor does the University discriminate on the basis of citizenship, within the limits imposed by law or University policy; nor does the University discriminate on the basis of sexual orientation. This nondiscrimination policy covers admission, access, and treatment in University programs and activities, and application for and treatment in University employment.

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

Inquiries regarding the University's equal opportunity policies may be directed to the Vice Chancellor of Academic Affairs and Affirmative Action Officer, 521 Mrak Hall, 752-2070. Speech and hearing impaired persons may dial 752-6889.

Sexual Harassment. Sexual harassment of students, staff, or faculty members is prohibited by law and by University regulation. Sexual harassment is unacceptable and will not be condoned on the UCD campus. The campus community will take all necessary and appropriate steps to protect students, staff, and faculty from sexual harassment and all forms of sexual intimidation and exploitation. Grievance procedures for student complaints charging legally impermissible discrimination (Policy 280-05) are available in the Office of Student Activities and Conduct and may be used to bring complaints of sexual harassment. Students may receive informal counseling and formal assistance by contacting any of the following offices: Vice Chancellors, Deans of the Schools and Colleges, or the Office of Student Activities and Conduct. In addition, the ASUCD Student Grievance Center, Counseling Center, and the Women's Resources and Research Center are available to provide referral service.

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CALENDAR

Academic Calendar*

	FALL 1984	WINTER 1985	SPRING 1985	FALL 1985
• Pick up registration and course enrollment materials from the Registrar's Office (all continuing students).	May 21-Aug. 3	Nov. 5-7 (1984)	Feb. 6-8	
• Faculty advisers available to all students.	June 4-5	Nov. 12-13	Feb. 11-12	
• Turn in course enrollment forms and student data card (all continuing students).	May 21-Aug. 3	Nov. 12-13	Feb. 11-12	
• Turn in fees along with fee statement (all continuing students).	May 21-Aug. 10	Nov. 12-21	Feb. 11-Mar. 1	
• **Quarter begins.**	**Mon., Sept. 17**	**Wed., Jan. 2**	**Thurs., Mar. 28**	
• Orientation and testing.	Sept. 17-19	Jan. 2-3	Mar. 28-29	
• In-Person Registration.	Sept 17-18	Jan. 2-3	Mar. 28-29	
• In-Person Enrollment.	Sept. 19	Jan. 3	Mar. 29	
• **Instruction begins.**	**Thurs., Sept. 20**	**Fri., Jan. 4**	**Mon., Apr. 1**	
• Final day of late registration.	Wed., Oct. 3	Thurs., Jan. 17	Fri., Apr. 12	
• Final date to file petitions to change status from part-time to full-time student, or vice versa.	Oct. 3	Jan. 17	Apr. 12	
• Final date to file petitions to add courses to study list without paying a $3 service fee.	Oct. 3	Jan. 17	Apr. 12	
• Final date to file petitions for PELP.	Oct. 3	Jan. 17	Apr. 12	
• Final date to petition to add or drop courses (thereafter permission may be granted only by the dean of your school or college and only under exceptional circumstances).	Wed., Oct. 24	Fri., Feb. 8	Fri., May 3	
• Final date for undergraduates to file petitions with the dean of their college or school to take courses on a P/NP basis. Exceptions rarely approved.	Oct. 24	Feb. 8	May 3	
• Final date for graduate students to file petitions with the Dean of the Graduate Division to take courses on a S/U basis.	Oct. 24	Feb. 8	May 3	
• Final date to file Independent Study Program project proposal form with the Academic Senate Committee on Courses of Instruction.	July 18	Oct. 29 (1984)	Jan. 28	July 19
• **Instruction ends.**	**Fri., Nov. 30**	**Thurs., Mar. 14**	**Thurs., June 6**	
• Final examinations.	Dec. 3-8	Mar. 16-22	June 8-14	
• **Quarter ends.**	**Dec. 8**	**Mar. 22**	**June 14**	
• Commencement.			Mid-June	
• **Academic and Administrative Holidays.**	Thurs-Fri., Nov. 22-23 Mon.-Tues., Dec. 24-25 Mon.-Tues., Dec. 31-Jan. 1	Mon., Jan. 21 Mon., Feb. 18 Mon., Mar. 25	Mon., May 27	Thurs., July 4 (Summer) Mon., Sept. 2 (Summer)

Candidates for Degrees
Undergraduates

• Filing period for those who expect to complete work for A.B. and B.S. degrees to file an Announcement of Candidacy with the Registrar.	Aug. 30-Oct. 3	Nov. 28-Jan. 17 (1984-85)	Mar. 14-Apr. 12	June 4-July 5 (for Sept. '85)
• Final date for Agricultural and Environmental Sciences students who plan to complete work for a minor program to file applications with the Dean's Office.	Wed., Oct. 3	Fri., Jan. 17	Fri., Apr. 12	Fri., July 5 (for Sept. '85)
• Final date for Letters and Science students who plan to complete work for a minor program to file applications with the Dean's Office.	Fri., May 25	Fri., Nov. 16 (1984)	Fri., Mar. 1 (for June '85 and Sept. '85)	Fri., May 24

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

Graduate Students

	FALL 1984	WINTER 1985	SPRING 1985	FALL 1985
• Final date for those who expect to complete work for master's degrees to file applications for candidacy with the Dean of the Graduate Division.	Mon., Oct. 1	Fri., Jan. 11	Mon., Mar. 4	Mon., June 3 (for Sept. '85) Tues., Oct. 1 (for fall '85)
• Final date for candidates for master's degrees to file theses with the committee in charge.	Thurs., Nov. 1	Mon., Feb. 11	Mon., May 13	Thurs., Aug. 1 (for Sept. '85)
• Final date for candidates for master's degrees to file theses or final report on comprehensive examination with the Dean of the Graduate Division.	Fri., Dec. 7	Fri., Mar. 22	Fri., June 14	Fri., Sept. 6 (for Sept. '85)
• Final date for those who expect to complete work for the degrees of Doctor of Philosophy and Doctor of Engineering to file applications for candidacy with the Dean of the Graduate Division.	Wed., Aug. 15	Thurs., Nov. 15 (1984)	Fri., Feb. 1	Fri., May 24 (for Sept. '85) Thurs., Aug. 15 (for fall '85)
• Final date for candidates for the degrees of Doctor of Philosophy and Doctor of Engineering to file theses with the committee in charge.	Mon., Oct. 1	Mon., Jan. 7	Mon., Apr. 1	Mon., July 1 (for Sept. '85)
• Final date for candidates for the degrees of Doctor of Philosophy and Doctor of Engineering to file theses with the Dean of the Graduate Division.	Fri., Nov. 30	Fri., Mar. 1	Mon., June 3	Mon., Aug. 26 (for Sept. '85)
Admission Deadlines				
• Applications for admission to undergraduate standing, including applications for intercampus transfer and EOP/SAA, must be filed with complete credentials with the Office of Undergraduate Admissions on or before this date.	Nov. 30 (1983)	July 31 (1984)	Oct. 31 (1984)	Fri., Nov. 30 (1984)
• Applications for admission to graduate standing, with complete credentials, must be filed with the Dean of the Graduate Division on or before this date.	June 1	Oct. 1 (1984)	Jan. 1	June 1
• Applications for admission to the Graduate School of Administration for 1985-86 must be filed with the School on or before this date.				Apr. 1
• Applications for admission to the School of Law for 1985-86 must be filed with the School on or before this date.				Feb. 1
• Applications for admission to the School of Medicine for 1985-86 must be filed with the School on or before this date.				Nov. 1 (1984)
• Applications for admission to the School of Veterinary Medicine for 1985-86 must be filed with the School on or before this date.				Nov. 1 (1984)
• Applications for readmission to undergraduate status must be filed with the Registrar on or before this date.	Fri., Aug. 17	Fri., Dec. 7 (1984)	Fri., Mar. 8	Fri., Aug. 16
• Applications for readmission to graduate status must be filed with the Graduate Division on or before this date.	Wed., Aug. 1	Mon., Nov. 12 (1984)	Mon., Feb. 4	Thurs., Aug. 1
Financial Aid Deadlines				
• Applications for grants, loans, work-study, and California Student Aid Commission awards for 1985-86 must be filed with the Financial Aid Office on or before this date.				Thurs., Feb. 7
• Applications for UCD undergraduate scholarships for 1985-86 must be filed with the Scholarship Office on or before this date.				Fri., Jan. 11
• Applications for President's Undergraduate Fellowships for 1985-86 must be filed with the Scholarship Office on or before this date.				Fri., Nov. 9 (1984)
• Applications for fellowships and graduate scholarships for 1985-86 must be filed with the Graduate Division on or before this date.				Jan. 15

Introduction

THE DAVIS CAMPUS

James H. Meyer, chancellor of UC Davis, administers this campus of 18,969 students, and 1,488 teaching faculty.

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 Administration, Law, Medicine, and Veterinary Medicine. Approximately 5,139 students are engaged in graduate or professional study.

The University of California, Davis is accredited by the Western Association of Schools and Colleges, Association of American Law Schools, Association of American Medical Colleges, Council on Education of the American Veterinary Medical Association, Engineering Accreditation Commission of the Accreditation Board of Engineering and Technology, Inc., American Chemical Society, American Society of Landscape Architects, the Commission for Teaching Preparation and Licensing, and the Joint Commission on Accreditation of Hospitals.

UCD's History

The Davis campus grew out of legislation passed in 1905 establishing a "University Farm" where young men and women could combine the scientific whys with technical hows in agriculture. The land for the campus was purchased in 1906, and the first students came to Davis in 1908, some for limited course work and some from UC Berkeley for practical training in agriculture.

The demand for greater educational opportunities in the state increased rapidly and in 1922, in conjunction with the UC Berkeley College of Agriculture, the degree of Bachelor of Science in Agriculture was granted those who completed the Davis program. A few years later, the Davis campus had its own College of Agriculture and, in 1948, the School of Veterinary Medicine (still the only one in the state) was established.

The campus's most rapid expansion began in 1951 when the College of Letters and Science was founded and more varied degree programs became available. In 1959, The Regents declared Davis a general campus of the University. By 1961, graduate programs were so numerous that a Graduate Division was established as a separate administrative unit. The College of Engineering came into existence the following year, owing much to the foundation already provided by the curriculum in Agricultural Engineering. The School of Law held its first classes in the fall of 1966, and the School of Medicine admitted its first students in the fall of 1968. The Graduate School of Administration began holding classes in the fall of 1981.

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

UCD has long been known for teaching and research in agricultural sciences. The reputation of the Davis campus in many other fields has advanced as Davis has moved into the ranks of the top 25 general research universities in the United States.

The Setting

The Davis campus lies adjacent to the city of Davis (population 38,300), 15 miles west of Sacramento and 72 miles northeast of San Francisco. Sacramento, with all its resources as the state capital, is only twenty minutes away, yet Davis is surrounded on all sides by open space—including some of the most valuable agricultural land in the state. The total campus comprises approximately 3,600 acres. About 980 acres are devoted to the central campus, the remainder being used for agricultural research and for such special facilities as the Veterinary Medical Teaching Hospital, the California Primate Research Center, and the University Airport. (The University of California, Davis, Medical Center is located in Sacramento.)

Its location makes Davis ideal for access to outdoor recreation. Within a 70-mile radius are Lake Berryessa, Folsom Lake, Clear Lake, the famed Napa Valley, and the historic Mother Lode country. San Francisco is a little more than an hour's drive from Davis along Interstate Highway 80. The coastal areas of Mendocino and Santa Cruz are about 150 miles from Davis, as are Lake Tahoe and the ski areas of the Sierra Nevada.

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

Davis is very much a bicycling town. More than 40 miles of bike paths and 30,000 bicycles have given Davis the title "City of Bicycles." One study found that bicycles are used for 25 percent of all travel in Davis.

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

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

"The students who attend Davis are what I like best: friendly, unpretentious, diverse, and intelligent. They have inspired me more than I thought possible."

- Junior, Psychology

Campus Life

The Davis campus has always been especially noted for its friendliness and informality. To many people, Davis brings to mind Picnic Day (the annual campus open house in April) and the almost universal use of bicycles within the community. Since the Davis campus is a residential community and was originally small and isolated, a tradition of close relations between students and faculty has developed. Even though the campus has now grown to 18,969 students, its style remains friendly, informal, and personal. As the campus moves into the eighties, a special effort will be made to reflect the diversity of the general population by attracting more ethnic minorities, handicapped students, Vietnam-era veterans, and other underrepresented groups.

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

The City of Davis

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

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

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

The city of Davis is changing. It still retains many characteristics of the small college town it once was, but the growth of the University has brought a corresponding development within the community. From fewer than 22,000 people only a decade ago, the population of Davis stands today at over 38,300.

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

Davis is possibly the most energy-conscious city in the U.S. Since 1973, average residential electrical consumption has dropped by 20 percent, while natural gas consumption has been reduced more than 40 percent. A series of energy-savings ordinances passed since 1968 regulates such things as new home insulation and window area and requires all new housing developments to have bicycle paths.

The Davis Campus Today

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

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

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

THE 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. Some 150 laboratories, Extension centers, and research and field stations on campuses and in other parts of the State strengthen research and teaching while providing public service to California and the nation.

The nine campuses of the University have a current enrollment of more than 141,300 students, 90 percent of them residents of California. More than one-quarter of the students are studying at the graduate level.

The University's reputation for excellence has attracted a distinguished faculty of scholars and scientists in all fields of scholarship. In a recently conducted survey, published in the *Chronicle of Higher Education*, 4,000 faculty at four-year colleges and universities throughout the U.S. were asked to name the departments in their disciplines which "have the most distinguished faculties." Four UC campuses, including UC Davis, were named to the top ten in at least one field and two campuses were named in more than five fields. The University has 15 Nobel Laureate winners on its faculty, and the total membership from all nine campuses in the National Academy of Sciences is the largest of any college or university system in the country. In 1984, 28 scholars from within the University received fellowship grants from the John Simon Guggenheim Foundation. These fellowships are among the highest honors that scholars can receive.

Governance of the University is entrusted to a corporation called The Board of Regents. Of the individuals comprising the Board, 20 are prominent California citizens appointed by the Governor; and seven, including the President of the University and the Governor of California, serve *ex officio*. A Student Regent is selected each year from a list of names submitted to the Board by the Student Body Presidents' Council.

The Regents have delegated authority in academic matters to the Academic Senate of the faculty, which determines academic policy and supervises the instructional activities of the entire University. All of the permanent faculty, as well as key administrators, are members of the Senate.

The Regents have delegated authority for the organization of the University to the President. David Pierpont Gardner is president and head of the universitywide administration. Authority for the administration of each campus has been delegated to a chancellor.

THE UNIVERSITY LIBRARY

Information:
Peter J. Shields Library Office
108 Shields Library
752-1203

The library on the Davis campus contains more than 1,827,150 volumes and receives more than 46,480 periodicals, serials, and government publications annually. Its holdings in the natural sciences and agriculture are outstanding. There are strong collections in the humanities, social sciences, fine arts, and engineering. Materials in law and medicine are already substantial and are still growing. According to a recent survey by the Association of Research Libraries, the UCD Library ranks twenty-third among the ninety-nine academic libraries surveyed on its "overall library index."

In addition to the main stack collection in the Peter J. Shields Library, there are 1,829,939 items on microcopy, 105,374 maps, 538,560 pamphlets, 20,600 rare books, and 14,473 sound recordings. The use of most Library materials has been made easier by a computerized circulation control system.

The Library provides orientation and assistance in using the various library collections, which operate on an open-stack basis to permit users direct access to the shelved volumes. Audiotape walking tours and lectures on the uses and resources of the Library are part of the Educational Services Program. Courses can also greatly assist the Library user: a 2-unit course, "Introduction to Library Research and Bibliography" (English 28), is given every year; a 1-unit course, "Biology/ Agriculture Library Research" (Entomology 298), is given twice a year, and a professional course, "Biomedical Information Resources and Retrieval" (Epidemiology and Preventive Medicine 401), is given each fall.

A valuable research tool is the Automated Information Retrieval Service (AIRS), which is available in the Humanities/Social Sciences, Biological and Agricultural Sciences, and Government Documents Departments, and the Physical Sciences, Health Sciences, and UCD Medical Center Libraries. This service connects local terminals to computerized databases which provide information and printed bibliographies of periodical literature and books, often including abstracts, in almost all subject areas. Citations can be produced in printed or machine-readable form. The information contained in the databases goes back about 20 years and in some cases is as up-to-date as yesterday's newspapers. Numeric and directory information are also available. Selective dissemination of information (SDI) is available from most databases to help researchers regularly update their knowledge. There is a cost for AIRS services.

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

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

Unbound periodical titles—some 6,500—are housed in the Periodicals Room in a closed-stack area. They are for use in the Shields Library only.

The Department of Special Collections provides assistance in the use of rare books, the Hinman collator, University archives, The Performing Arts Collection, and the 383,000-item F. Hal Higgins Library of Agricultural Technology.

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

In addition to the collections and facilities of the Shields Library, there are branch libraries for the health sciences, the physical sciences and engineering, and agricultural economics. The Health Sciences Library's approximately 186,849 volumes support programs in both human and veterinary medicine. The Physical Sciences Library contains 176,864 volumes and also houses a collection of more than 833,000 Research Reports of the U.S. Department of Energy, the National Aeronautics and Space Administration, the Nuclear Regulatory Commission, and other governmental agencies. An independent Law Library housing about 191,824 volumes supports the instructional and research programs of the School of Law. There are also a number of specialized departmental libraries located on the campus.

RESEARCH AND SERVICE ACTIVITIES

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

University of California Arboretum

Arboretum Headquarters
Temporary Building 32
752-2498

The Arboretum occupies an area of about 111 acres, providing materials for teaching and research. Most of the plants are attractive but drought-tolerant trees and shrubs. The acreage also includes paths and picnic tables for recreation.

Outstanding plant collections are represented by the oaks in the Shields Grove, the California native trees and shrubs, which are also represented in the Mary Wattis Brown Garden, and the T. Elliot 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).* Two gardens of herbaceous perennials are next to Shields Grove: the Carolee Shields gazebo and white flower garden, and the Ruth Risdon Storer Garden of hardy plants.

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

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

Center on Administration of Criminal Justice

101 King Hall
752-2893

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

Agricultural History Center

378 Voorhies Hall
752-1827

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

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

California Primate Research Center

Primate Center
752-0447

The research staff of the California Primate Research Center investigates selected human health problems of which the nonhuman primate is the animal model of choice. Research programs include developmental and reproductive biology, fetal and neonatal medicine, respiratory diseases, and a variety of biomedical collaborative research projects. A major theme of the CPRC encompasses the adverse effects of environmental factors on vertebrate organisms and the recognition and development of new spontaneous and experimentally-induced disorders. Primate medicine and primate pathology teams are responsible for the maintenance of the health of the colony and for research on spontaneous diseases.

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

The facilities and training programs of the Center are currently being used by 60 core and affiliate faculty members, over 40 collaborative scientists, more than 90 undergraduate and graduate students, visiting scientists, and approximately 100 technical and supporting staff members.

Campus Writing Center

Information:
752-8024

The Campus Writing Center, which began in the fall of 1981, is a multi-faceted program designed to provide writing instruction across the curriculum. Its primary means of accomplishing this goal are through

- Adjunct writing courses
- Writing workshops, and
- Individual writing consultations.

"Writing is essential. There is no substitute for writing to make the student clarify thought. No word processor or secretary can ever take care of muddy thinking."

- Professor, Engineering

Adjunct writing courses are offered for credit to students who are also enrolled in specific courses in other fields. These courses provide instruction in expository or scientific writing and assist students with research and writing skills appropriate for the field of study involved. Topics of instruction and writing assignments in each adjunct course all pertain to the subject matter of the companion course.

The writing workshops focus on specific aspects of academic writing and are adapted to meet the needs of any field. They also can be designed for particular audiences—for TAs correcting and evaluating student papers, for scientists or engineers writing technical reports, for graduate students writing theses, or for undergraduate students writing essay exams or term papers. Workshops, which may run for one session or several, are available upon request by any interested faculty member or campus group.

Individual writing consultations are available by appointment to any interested faculty, staff, or graduate student. To schedule a consultation, call the Campus Writing Center at the number above.

The Campus Writing Center is affiliated with the English Department. All services of the Center are provided free of charge to UC Davis students, faculty, and staff.

Computer Center

50-I Hutchison Hall
752-0233

The Computer Center, located in the basement of Hutchison Hall, serves the campus for batch, interactive timesharing, and remote job entry computing. The Center's primary concern is service to students and, therefore, instructional usage has priority over research and administrative users. Davis has developed an innovative Easy Access System of Computing for student use. Any student on campus, upon presentation of a valid registration ID card at the Computer Center Dispatch Counter, may open an Easy Access account. A specified sum is allotted to each student from instructional funds, and, within general confines, the student may use the funds to purchase computer time for any project. Regularly scheduled computer-related courses are funded separately.

Equipment operated by the Center includes a dual processor Burroughs B7800, the primary administrative computer; a dual processor Burroughs B6800; four Digital Equipment Corporation (DEC) PDP 11/70 systems; a DEC VAX 11/780 and two VAX 11/750s. These systems support over 185 terminals located in seven

terminal rooms plus over 300 additional terminals located throughout the campus. One of the terminal classrooms is designed primarily for teaching interactive graphics. During open hours these classrooms can be used by students any time that class instruction is not scheduled. Consultants are available to answer questions. Additionally, there is a microcomputer classroom with ten DEC Rainbow 100s. The number of microcomputers is scheduled to expand as funds become available.

The computer systems located in Hutchison Hall are accessed through the Develcon Dataswitch. This switching computer allows the user to identify from an individual terminal the computer system required for the work which is to be accomplished. The three systems located in Surge IV and the one in Academic Office Building 4 have terminals directly connected, and only limited access through the Dataswitch. Keypunch machines and card readers are available for batch input to the Burroughs systems. The Center also operates two public Remote Computing Stations on campus. Services and equipment at these stations include program consulting, reference manuals, interactive terminals, keypunch machines, and card readers.

Center for Consumer Research

148 Everson Hall
752-2647

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

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

Early Childhood Laboratory

Temporary Building 117
752-2888

The Early Childhood Laboratory was established in 1963 by the Department of Applied Behavioral Sciences and serves as a facility for students majoring in Human Development and for other students interested in young children. The four programs at the Laboratory accommodate children from ages 6 months to 5 years of age for three hours each day.

Students from several classes use the facilities, some doing observational studies and others gaining experience working with the children. The students learn to relate theory and practice, developing their abilities as they relate to professionals, peers, children and parents. Selected graduate students and faculty members also conduct research at the Laboratory. Enrollment information may be obtained by calling or writing the Laboratory.

Veterinary Medicine Teaching and Research Center

18830 Road 112
Tulare, California 93274
(209) 688-1731

The new facilities of the Tulare Center were occupied on the thirty-first of January, 1983. Located in a region of the State that has concentrated, diversified livestock production enterprises, the Center will be developing programs with livestock production units to serve as a principal clinical center of UCD's School of Veterinary Medicine for teaching, research, and service programs on food-animal herd health, preventive medicine, and production management.

Water Resources Center

2102 Wickson Hall
752-1544

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

Research interests include water resource systems engineering, economic evaluation of water development and conservation, political strategy in water resource development, environmental and energy relationships in water resource management, watershed hydrology, ground water use, soil and land use management in relation to water resource use, and maintenance and improvement of water quality.

Facility for Advanced Instrumentation

9 Hutchison Hall
752-0284

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

Institute of Ecology

2132 Wickson Hall
752-3026

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

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

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

Institute of Governmental Affairs

Shields Library
752-2042

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

IGA activities include publishing several types of studies; preparing grant proposals for extramural funding of social science research; administering extramural grants; providing a specialized library of published and fugitive materials open to faculty, students, and other users; providing a Social Science Data Service; training graduate and undergraduate students in research methods through participation in faculty-led projects; and conducting policy workshops and conferences.

Institute of Marine Resources

Temporary Building 186
752-2506

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

Intercampus Institute for Research at Particle Accelerators

Professor Richard L. Lander, Director
325 Physics/Geology Building
752-1780

This Universitywide Institute, established in 1977, conducts research that uses the unique facilities at national accelerator laboratories, particularly the Stanford Linear Accelerator Center and the Enrico Fermi National Accelerator Laboratory. High-energy particle physics is the dominant area of research. The Institute allows faculty and graduate students to undertake experimental projects that could not be implemented on an individual campus. The Institute also promotes seminars and lectures by visiting researchers at individual campuses.

Bodega Marine Laboratory

Box 247
Bodega Bay, California 94923
(707) 875-2211

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

Crocker Nuclear Laboratory

Crocker Nuclear Laboratory
752-1460

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

Laboratory for Energy-Related Health Research (LEHR)

Laboratory for Energy-Related Health Research
752-1340

The Laboratory for Energy-Related Health Research is a focus for coordinated interdisciplinary research and teaching about biomedical problems related to exposure to effluents of energy fuel cycles. The overall aim of the research programs at LEHR is to determine basic mechanisms of effects and predict human health hazards from continual exposure to realistic levels of energy-related pollutants. To this end, research animals are exposed to graded levels of radiation and fossil fuel pollutants, and the data obtained are used to establish levels harmful to humans. Expanded programs to study toxic, mutagenic, and carcinogenic compounds are done in special animal holding facilities, and in laboratories for cell biology research and inhalation toxicology.

Serology Laboratory

Horse Bloodtyping Laboratory
Armstrong Tract
752-2211

Cattle Bloodtyping Laboratory
Armstrong Tract
752-7383

The Serology Laboratory was established in 1955 largely to provide unique blood-typing services for the animal breeding industry. It is a self-supporting activity which generates income mainly through blood-typing services for various cattle and horse breed registries in North America. The laboratory functions as a division of the Department of Reproduction, School of Veterinary Medicine, and its facilities are available to students working towards M.S. and Ph.D. degrees in genetics, immunology, and comparative pathology. The facilities are also available to upper division students interested in gaining experience through the Internship Program.

Current research activities of the Serology Laboratory are concerned largely with a thorough immunogenetic analysis of the major histocompatibility complex (MHC) of domestic animals, in particular the MHC of cattle and horses. As established mostly during the past decade, the MHC is a chromosomal region which contains genes that govern the functions of the immune system. The key to the MHC analysis is the elucidation of the various antigenic markers which characterize the membrane of lymphocytes. These markers, originally referred to as histocompatibility antigens because of their role in the rejection of allografts, are associated with resistance or susceptibility to a variety of diseases. The Laboratory has a reputation for its pioneering research on animal blood groups and biochemical polymorphisms, and is researching these areas on a continuing basis. In addition, the Laboratory provides karyotyping services for infertility cases in domestic animals and has research programs to uncover the mode of inheritance of suspected hereditary diseases.

In all of its programs, the Laboratory works closely with the Equine Research Laboratory and the Livestock Diseases Research Laboratory, as well as with departments such as Animal Science, Avian Sciences, Veterinary Pathology, and Epidemiology and Preventive Medicine.

Stebbins Cold Canyon Reserve

Wesley W. Weathers, Ph.D.
Department of Avian Sciences
109 Asmundson Hall
UC Davis
752-1300

Information:
Natural Reserve System
2120 University Avenue
Berkeley, CA 94720

The University of California administers some 26 natural reserves throughout the state. These reserves comprise a representative cross-section of California's diverse ecosystems and include deserts, off-shore islands, mountains, and even submarine canyons. Unlike parks or wilderness areas, the reserves are devoted entirely to teaching and research purposes and are not available for recreation. Since 1965, when the program was initiated, the University, using non-state funds, has acquired these carefully selected sites which might otherwise have become unavailable for scientific study.

In 1979, the University purchased the Cold Canyon property, 277 acres of wildland near Lake Berryessa (about 24 miles west of campus), as part of its Natural Reserve System. The reserve is named in honor of G. Ledyard Stebbins, Professor of Genetics. The Davis campus has administrative and management responsibility for the reserve, which will be maintained in its present natural state. The reserve is available for teaching and field research by scientists and students from all campuses of the University and researchers from other institutions of higher learning.

Terrain and rainfall patterns of the Cold Canyon area support examples of several different plant communities found in both the inner and outer coast ranges. The diversity of plant and animal species on the reserve, and its close proximity to the campus, contribute to the popularity of the reserve as an open-air classroom and research site.

Adult Fitness Program

Department of Physical Education
752-2540

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

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

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

Agroecology Program: Student Experimental Farm

Information:
College of Agricultural and Environmental Sciences
752-7645

This program was initiated in the summer of 1977 following several years of courses, discussions, and analysis of "alternative" agriculture and its importance to the College of Agricultural and Environmental Sciences. The Student Experimental Farm is an innovative research facility run by the students on 23 acres of University land. Students participate as volunteers, work-study interns, and Research Associates. Its purpose is threefold, as (1) an educational adjunct to the curriculum providing graduate and undergraduate students with the opportunity to design, conduct, and analyze their own field experiments; (2) a research and development program for conducting valid scientific research in small-scale and alternative technologies; and (3) a small farm and garden extension service.

Carnegie Institution of Washington, Department of Embryology, Davis Division

752-0210

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

The resources of this department are available to qualified investigators on a very limited basis, on application to the Director.

ADDITIONAL ACADEMIC RESOURCES

UNIVERSITY EXTENSION

Information and catalogs:
414 Surge IV
752-0880

Venture, the free quarterly University Extension catalog, contains the current list of continuing education programs offered in 34 northern California counties. Enrollment is open to the general public. No formal admission to student status is required to take advantage of the wide variety of stimulating programs.

Fields covered by Extension courses include administration, agriculture, business and management, computer studies, education, engineering, environmental studies, graphic design, human services, labor relations, liberal arts, personal financial planning, toxics and hazardous materials management, wilderness recreation and international travel, and winemaking.

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 and nearby college faculties, professionals in the field, and internationally known experts.

Enrollment fees enable University Extension to function as a financially self-supporting nonprofit enterprise.

COMMITTEE FOR ARTS AND LECTURES (CAL)

Information:
104 Freeborn Hall
752-2523

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

In 1984-85 CAL will be presenting music and dance concerts, films, plays, poetry readings, lectures, solo recitals, orchestral performances, and free noontime entertainment on the Quad.

Tickets are available to UCD students 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.

CAMPUS EVENTS AND INFORMATION

Information:
Campus Events and Information Office
4th Floor, Memorial Union
752-1920

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

Information Services, a unit of the Campus Events and Information Office, provides campus information to visitors, staff, and students at its three locations, the Memorial Union Desk located in the first floor lounge and in Room 129, Mrak Hall, and at the Visitor Information Kiosk on Old Davis Road. Tours of the campus can be arranged through the Information Services Office, telephone (916) 752-0539.

"UC Davis can offer a lot in addition to academics if you're willing to look around."

- Sophomore, Human Development

PUBLIC SERVICE RESEARCH AND DISSEMINATION PROGRAM

Information:
436 Mrak Hall
752-3224

The Public Service Research and Dissemination Program is an outgrowth and continuation of a five-year grant from the W.K. Kellogg Foundation. The present funding of the program is by a combination of private grants, including the W.K. Kellogg Foundation, University funds, and William and Flora Hewlett foundation.

The program will continue to link faculty, graduate students, and decision makers from outside agencies in collaborative research projects on issues of public policy. It will also encourage the dissemination of research information on public policy issues through publications and policy conferences.

SUMMER SESSIONS

Information:
376 Mrak Hall
752-1647

Summertime affords students the opportunity to accelerate progress toward a degree, to tackle problem courses and meet prerequisites, or to take special study courses or do research. You can complete up to 24 units of credit by attending both summer sessions.

Summer sessions at Davis offers a wide variety of lower-division and upper-division courses and some graduate courses that provide full University credit. Special programs are also available in Great Britain. Admission is open to all university students, high school graduates, and other qualified applicants. However, admission to a summer session does not constitute admission to the University's regular sessions.

In 1985 there will be two six-week sessions at UC Davis: June 17 through July 26, and July 29 through September 6. For the *Summer Sessions Bulletin* and application materials (available about mid-March), write to the address above.

WORK-LEARN INTERNSHIPS

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

Where are you going with your life?

That question is hard to answer in today's complex world. You may need to clarify your personal or educational goals. Or expand your awareness of the "working world." Or find out if you are really interested in a career in business, research, teaching, or agriculture.

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

You can take advantage of one of the hundreds of organized internships through Work-Learn, or initiate your own. Established internships include opportunities in:

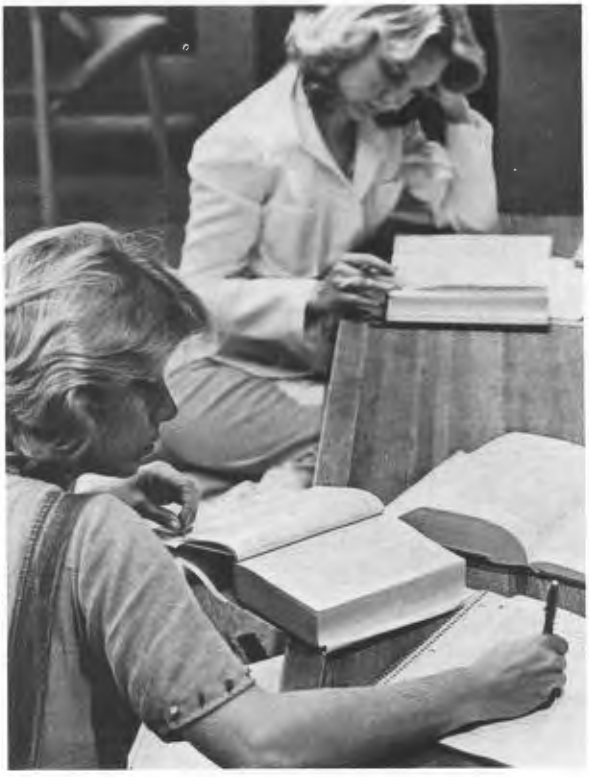
- agricultural and environmental sciences
- education and counseling
- engineering and physical sciences
- health and biological sciences
- liberal arts

An internship may be full time or part time, credit or non-credit, voluntary or salaried—depending on your needs and interests and the availability of openings. Work-Learn experience must emphasize learning rather than routine activities, and include field supervision by a qualified professional and, where appropriate, the faculty member responsible for giving credit.

A notation describing the internship can be made on your transcript by obtaining prior approval from Work-Learn and Career Planning and Placement. Approval for transcript notation is granted for completed internships which meet prescribed University standards as advertised by this office. Academic credit is awarded only for experiences planned and approved in advance by the sponsoring faculty member.

"One of the great benefits of an internship is the practical experience it offers in the field of one's choice. I have been able to define my career goals in a much more realistic manner."

- Senior, Political Science



EDUCATION ABROAD

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

Academic Adviser:
Robert A. Fahrner, Ph.D., Campus Coordinator
Dean's Office, College of Letters and Science
752-0392

The United Kingdom, Japan, Sweden, Norway, Mexico, Brazil, Hong Kong, Ireland, Egypt, France, Austria, Taiwan, China, Germany, Italy, Israel, Spain, Kenya, India,

Peru, the USSR, Australia, and West Africa.

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

Most EAP experiences are for undergraduates for an academic year. Exceptions are the one-semester programs in Leningrad (USSR), Beijing and Nanjing (China), and the spring- or fall-quarter study and field experience program in Mexico.

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

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

Eligibility requirements include:

- At least three regular session quarters completed in residence at UC by the time of participation
- At least 90 quarter units completed by the time of participation
- At least a 3.0 grade-point average for coursework completed at UC at the time of application and departure
- In most cases, 2 years (6 quarters) of University-level foreign language or the equivalent, with a 3.0 grade-point average (not applicable where classes are in English), but consult EAP Office for specific requirements
- An academic plan approved by your major adviser and the campus coordinator
- Endorsement of the Academic Senate Committee on the Education Abroad Program

To help overcome "culture shock" and prepare you for your academic schedule, University of California professors administer intensive language and orientation programs at many of the 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 all-inclusive minimum costs for the nine- to twelve-month program range from $5,100 to $8,500 (varies depending upon the country).

For study abroad during the 1985-86 academic year, the application deadlines are as follows: mid-November for the United Kingdom and Ireland and the spring quarter program in Mexico; mid-May for Australia and the fall quarter program in Mexico; and mid-to-late January for all other study centers. If you intend to participate in a study program during your senior year, careful advance planning is necessary to make sure that all degree requirements will be met (see also page 61). Consult with your major adviser, the Dean's Office of your college, and the Campus EAP Coordinator. See page 176 for information on EAP centers and study programs.

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

UNIVERSITY PROFESSORS

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

At present, the roster includes:

University Professor Melvin Calvin*
Laboratory of Chemical Biodynamics
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 Julian Schwinger
Department of Physics
UC Los Angeles

University Professor Glenn T. Seaborg*
Department of Chemistry
Associate Director, Lawrence Berkeley Laboratory
UC Berkeley

University Professor Neil J. Smelser
Department of Sociology
UC Berkeley

University Professor Edward Teller*
Lawrence Livermore National Laboratory
Livermore, California

University Professor Charles Townes
Department of Physics
UC Berkeley

University Professor Sherwood L. Washburn*
Department of Anthropology
UC Berkeley

University Professor John R. Whinnery
Department of Electrical Engineering and Computer Sciences
UC Berkeley

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

*Emeritus

"It's been very easy for me to obtain extra help in classes and get information concerning research and careers. The professors really care and are there to help if you seek them out."

- Senior, Biochemistry

Student Life

LIVING ACCOMMODATIONS

Residence Halls

Information:
Student Housing Office
(916) 752-2033

You can expand your UC Davis experience and add a measure of convenience to your life by living on campus; some 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. Eighty-six percent of the freshman students live in residence halls either on or off-campus. Twenty-seven percent of the transfer students live in residence halls on campus.

The total room-and-board rate for 1984-85 is $2,785 for a double-occupancy room and $3,015 for a single room (of which there are very few available to new residents). Nineteen meals per week are provided. Rooms come complete with furniture, study lamps, and private telephones; however, you must pay for your long distance and measured-service toll charges and provide your own linens and towels.

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

Student Family Housing

Information:
Student Family Housing Office
Orchard Park
(916) 752-4000

There are 476 furnished and unfurnished on-campus apartments for UCD student families. Student family housing rental rates are considerably lower than average for the Davis area and include the cost of utilities except for telephone service. Monthly rents for academic year 1984-85 are:

- Solano Park, one-bedroom unfurnished apartment, $214.
- Solano Park, two-bedroom unfurnished apartment, $243.
- Orchard Park, two-bedroom furnished apartment, $287.

Vacancies in student family housing are filled from a chronological list based on the date of application. You should anticipate a wait of about five to nine months for a fall assignment. An application may be submitted before you are admitted to the University and before you are married, but you must show documentation of your student and marital or parental status before occupancy can be granted. If a member of your family has a physical disability which requires special housing accommodation, please attach a detailed letter of explanation to your application.

Community Housing

Information:
Student Housing Office
(916) 752-2483

Approximately 75 percent of UCD students live off campus. If you choose to live off campus, the Community Housing Office can be a valuable resource. This office maintains listings to assist you in roommate selection and in locating rental housing off campus. Housing available in the community includes apartments, duplexes, condominiums, mobile homes, and rooms in private homes. Listings change daily, so they are not furnished by mail or given over the telephone.

Fraternities and sororities are another housing option for some students. Although many chapters have houses, living space is available for only a few members. These groups offer an opportunity to participate in a self-governing residential environment where maintenance, food preparation, social planning, and educational activities are shared by the members.

In addition to the listing service, the Community Housing Office provides grievance counseling and mediation to assist in resolving landlord/tenant disputes and roommate conflicts. Leasing information, publications, and the *Davis Model Lease* are also available at the Community Housing Office.

THE ARTS AT DAVIS

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

The Department of Music (752-0666) sponsors the University Symphony, Chorus, Chamber Singers, Early Music Ensemble, Concert Band, and small ensemble groups. Music majors and other interested students can receive credit for participation in these groups, which perform at concerts and recitals open to the University community. The Department also sponsors an artist-in-residence for one quarter each year who gives concerts, recitals, and lectures, and who works with music classes and individual students. Free noon concerts featuring individual performers and ensembles—both professional musicians and music students—are

"I got involved in clubs and activities so now I know a lot of people and usually have a choice of what to do weekends. You've got to develop your own social life."

- Senior, Chemistry

a favorite weekly event during the school year. The Robert Bloch String Quartet is in residence on campus, and the Department enjoys a close relationship with the Sacramento Symphony, which presents several concerts on campus each year. The Department of Music sponsors nearly one hundred public concerts each year.

The Department of Dramatic Art has one of the best theatre facilities in California. The excellent faculty and special guest artists, the presence of graduate students working on Master of Fine Arts (MFA) degrees in acting, directing, playwriting, and design, and an unusually good stock of scenery, props, costumes, and lighting equipment all contribute to the professional quality of Davis productions. Each year's drama schedule includes University Theatre Season (five major productions of established plays); one major production of an experimental piece; Premiere Season (five smaller productions of plays written by students); Studio Season (three smaller productions of established plays); and dozens of class-related projects. These productions are part of the academic program of the Department and serve an important purpose in the study of dramatic art. Participation is open to all students.

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

The **Richard L. Nelson Gallery** (752-8500), named in honor of the first chairperson of the Department of Art, was dedicated in 1976. Located on the first floor of the Art Building, the Gallery organizes regularly changing exhibitions of historical and contemporary works of art. The Gallery's program of high quality and rich variety reflects and complements the teaching program of the Department of Art and provides aesthetic enrichment to the University community and the Northern California area at large. The **Fine Arts Collection** (752-8500) is located adjacent to the Nelson Gallery. Representing various historical periods and cultures, it is the Davis campus's major collection of art. Selected works are available for viewing weekday afternoons. The **Basement Gallery** (752-0105) in the Art Building shows work by undergraduate UCD art students.

The **Carl N. Gorman Museum** (752-6567), established in 1973 in honor of Carl Gorman, an advocate of Native American Studies at UCD, features works of Native American and other ethnic artists. The museum, located in Temporary Building 111 (across from 194 Chemistry Building), has a permanent collection as well as exhibits that change throughout the year. The **Design Gallery** (752-6223) on the first floor of Walker Hall, organizes changing exhibitions which are planned from the design viewpoint and from special themes in the area of environmental design: architecture, interiors and landscape, graphics, costume, textiles, folk art—as well as the annual student show.

The Committee for Arts and Lectures (CAL) brings a wide variety of performing artists to campus, in addition to sponsoring lectures, films, and free noon-time events on the Quad. Various departments such as English, the foreign languages, and History sponsor lectures, poetry readings, and exhibits open to the University community. The *Campus Record,* a weekly information sheet published by the Office of Public Affairs (752-1930) and *Special Events,* a monthly flyer distributed by the Campus Events and Information Office (752-1920) list upcoming activities, and bulletin boards, kiosks, the student radio station KDVS, and the *California Aggie* also advertise programs and local events.

RECREATIONAL FACILITIES AND PROGRAMS

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

Facilities and programs such as the Equestrian Center, Craft Center, Outdoor Adventures, Recreation Hall, Intramural Sports, MU Art Gallery, Recreation Swimming Pool, or the Games Area will help you balance the academic demands at UCD with your leisure interests.

Memorial Union and Campus Recreation

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

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

The **Memorial Union** (MU) complex, at the north end of the Quad, serves as the community center for the campus by providing campus services and a variety of extracurricular activities. Bring yourself up-to-date on local events by stopping at the Information Desk in Griffin Lounge on the main floor. A valuable resource for current students as well as new students and visitors, the Information Desk can also be reached by telephone, 752-2222. Other first-level facilities include the UCD Bookstore, Corral gift shop, Coffee House, The Last Resort Restaurant and Pub, MU Dining Commons, and Freeborn Hall. Freeborn, an 1,800-seat assembly hall used for dances, dramatic and musical events, banquets, lectures, and conferences, also houses the Committee for Arts and Lectures and the Campus Box Office, where you can purchase tickets for campus events and cash checks. Lower Freeborn is home to the Women's Resources and Research Center, the University Haircutters, and several ASUCD services.

King Lounge on the second floor features music listening and periodicals in a comfortable and relaxed atmosphere popular for studying. The MU Art Gallery and a complex of meeting rooms, the MU II Conference Center, complete the second floor. In addition to the administrative offices of Memorial Union and Campus Recreation, the offices of ASUCD, Campus Events and Information, the Graduate Student Association (GSA), and Student Activities and Judicial Affairs can be found on the third and fourth floors of the MU tower.

Outdoor patios furnished with wooden benches and umbrella tables offer open-air seating and the enjoyment

of a wisteria arbor and giant eucalyptus to the north of the MU and a five-story Aleppo pine to the south.

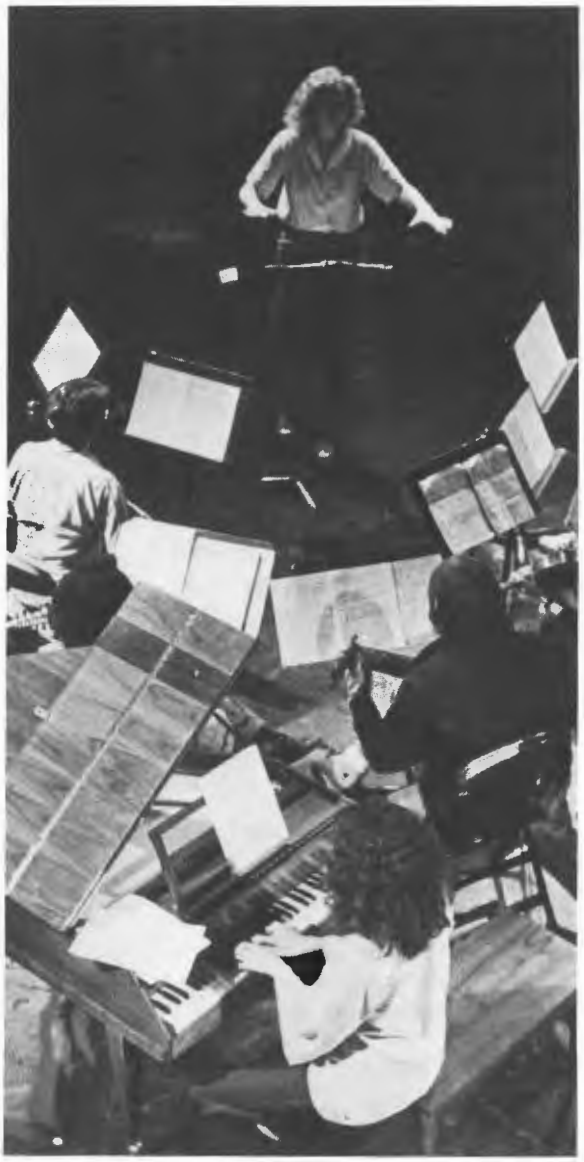
In addition to the overall operation of Memorial Union facilities, professional and student staff of the Memorial Union and Campus Recreation office coordinate the following facilities and programs:

The **Craft Center**, located in the southwest wing of the Silo and adjacent to parking lot 43, is an ideal place to channel your creative energy. Facilities are available on a drop-in basis, or quarterly passes may be purchased to use equipment and laboratories. Workshops and classes are offered each quarter in such varied crafts as woodworking, weaving, jewelry making, calligraphy, design, auto mechanics, ceramics, photography, silkscreen printing, oxyacetylene welding, leatherworking, and stained glass. More information about the Center can be obtained by calling 752-1475/1730.

The **Equestrian Center**, southwest of the Veterinary Medical Teaching Hospital off Garrod Drive, is active all year round providing trail rides, practice sessions, and instruction in both English and western riding. Group and private lessons are available for beginning through advanced levels, and an extensive volunteer program has been designed to provide an educational experience for those interested. The Equestrian Center sponsors clinics, horse shows, and a summer equestrian camp plus special events, and also coordinates a number of teams for student participation. Telephone 752-2372/1730 for further details.

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

The **Games Area**, located in the basement below the UCD Bookstore, is a recreational facility consisting of a bowling center with pro shop, billiards room, video arcade, pinball and table soccer machines, TV/cardroom (with large screen TV), refreshment area, and storage lockers. The Games Area has sign-ups for



bowling leagues, classes, clinics, and tournaments for all ages from beginning through advanced skill levels. Details are available by calling 752-2580/1730.

Outdoor Adventures, in Temporary Building 24 on the corner just west of 194 Chemistry Building, is a valuable resource center for planning your outdoor excursions and developing your outdoor skills. Rental equipment of professional quality is available as well as resource information from an up-to-date library of topographic maps, trail guides and other materials. Group rates and custom designed trips can be arranged, and classes, excursions and clinics in back-packing, rock-climbing techniques, white-water rafting, kayaking, boardsailing, mountaineering, cross-country skiing, and other sports are offered throughout the year. Many special activities such as wilderness emergency-care clinics, white-water river guide training, slide presentations, and programs conducted by outdoor experts are also held. Stop in and share your own outdoor experiences! For more information call 752-1995/1730.

The **Recreation Swimming Pool**, at the corner of LaRue Road and Hutchison Drive, is a large free-form pool with a separate wading pool, bathhouse, snack bar, and shuffleboard courts. The staff offers lessons to all age groups and arranges for special events such as "family nights." The pool opens for the season in April and closes in October. The Hickey Gymnasium pool is also available for recreational lap swimming. More information regarding these services can be obtained by calling 752-2695 or 752-1995/1730.

The Memorial Union has several facilities that can be rented for group gatherings. The **Recreation Pool Lodge**, adjacent to the pool, is equipped with a kitchen, meeting rooms, and a lounge with a fireplace. The **Silo Student Center**, southwest from the corner of California Avenue and Hutchison Drive, features a snack bar, a large multipurpose room, and video machines. The Silo is open daily for students who want to just relax or study and is reserved most evenings by one of the many student organizations holding meetings, dances, or other group functions. Finally, **Putah Creek Lodge,** equipped with outdoor barbecue pits and tables as well as an indoor fireplace, kitchen, and multipurpose room, is situated on the south side of campus on Putah Creek. It is surrounded by a large grassy area suitable for group recreation and outdoor activities. The bicycle and walking trail, which runs parallel to Putah Creek and directly in front of the lodge, offers much enjoyment as you pass along the Arboretum and view trees, shrubs, and other plant life used in research and teaching. To reserve these facilities call 752-1920. For more information, call 752-2524.

A special MU program, **the LINK,** views life as a total experience rather than a series of random or isolated activities. The purpose of the Lifestyle Information Network is to provide programs and services in six essential areas of personal growth and development—intellectual, emotional, physical, vocational, social and values. For more information about the LINK, call 752-LINK/1730.

Recreation Hall

Entrance 1B
752-6073 for information

Recreation Hall is a multi-use facility for intramural and informal recreation play, intercollegiate athletics practice and contests, physical education classes, sports clubs, and special events. The three-level hall has locker rooms; an equipment room; handball, racquetball, wallyball, and squash courts; a weight room with trained clinicians; an arena area for basketball, volleyball, and badminton; and areas for wrestling and martial arts, table tennis, gymnastics, and dance. Rec Hall's newest addition, the par course fitness room, utilizes a self-guided circuit training concept. An outdoor fitness cluster, located near Entrance 1B, is also available for stretching and strengthening exercises.

Students can use Rec Hall facilities by showing their current, valid Registration Card. Nonstudents may purchase a privilege card to use Rec Hall lockers, equipment, and facilities. Patrons may also purchase a daily pass at the Hall. Recreation Hall is available to campus affiliated organizations for special events.

Recreation Hall maintains the tennis courts on La Rue Road, just north of the Rec Pool, and the volleyball and basketball courts west of the Segundo residence

hall complex. While these courts are primarily for student use, they are also available to the general community when not being used for campus programs. No reservation is required as the courts are available on a first-come, first-served basis.

ASSOCIATED STUDENTS (ASUCD)

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

The Associated Students of the University of California, Davis (or ASUCD), authorized by The Regents and the Chancellor, represents all undergraduate students. From the fees paid to the University each quarter, The Regents allocate $14.50 per student to ASUCD to support the organization and its many activities. Graduate and professional students may have access to all ASUCD activities and services by paying the fee although certain services are available to these students by their participation in the Graduate Student or Law Student Associations. Funds allocated to ASUCD by the University provide activities and services that will make life as a student a little easier, less expensive, or just more fun.

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

Four commissions make recommendations to the Executive Council. Members of the commissions are appointed by a subcommittee of the Executive Council. The four commissions are:

External Affairs deals with off-campus concerns (City of Davis, The Regents, social responsibility, etc.).

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

Academic Affairs acts as an advocate of student rights in the area of academics, including dealing with the Academic Senate and with issues such as grading policies, tenure, and teacher evaluations.

Business and Finance makes recommendations to the Executive Council on all financial matters.

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

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

Some of the services operated by the ASUCD for University students include the Unitrans bus system, *California Aggie* newspaper, *Student Viewpoint* evaluation of professors and classes, Just Your Type wordprocessing service, the Bike Barn repair services, travel service, free legal advice, and the Coffee House in the Memorial Union. The ASUCD-sponsored Experimental College offers a variety of nontraditional classes each quarter for students interested in diversifying their educational experience. Other ASUCD activities include Radio KDVS stereo FM, Classical Notes, Rabbit Reproductions, Student Forums, Entertainment Council, and Picnic Day. ASUCD also cooperates with Associated Student groups on other University of California campuses to operate a full-time Student Lobby in Sacramento to represent student interests to State government.

STUDENT ACTIVITIES AND JUDICIAL AFFAIRS

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

There are more than 300 registered student organizations at UCD with a combined membership of over 17,000. These organizations represent a wide variety of student interests, including cultural, social, religious, political, ethnic, academic, international, recreational, performing, residence hall, and service groups. The **Student Activities** Office registers these diverse groups and provides advising on activities, resources, and campus policies. In addition to the subunits described below, Student Activities administers a number of campus programs: Club Finance Council, Film Co-Op, Activities Faire, Cultural Days, and Leadership Training

"I came here expecting to work hard and play hard to get the most out of being a student at Davis."

- Sophomore, Engineering

Workshops. Student Activities staff assist individual students who want to become involved in activities or start new organizations. All students are encouraged to drop by the office to review the resources available to them.

Judicial Affairs office supports the standards of the campus by responding to alleged violations of University policies or campus regulations. In addition, the office is a contact point and referral agent for student grievances based on impermissible discrimination (sexual, religious, handicap, etc.), or on violations of student rights to obtain access to or prevent disclosures from their campus records. The office also serves as a resource for conflict resolution and it can provide interpretations.

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

The **Ballet Folklorico del Alma** is a performing dance troupe that seeks to perpetuate Chicano culture through the traditional music, dance and costumes of Mexican folklore. All interested students are invited to participate in the troupe.

ADVISING AND COUNSELING

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

Advising Services

Information:
109 South Hall
752-3000

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

Academic Peer Advising places peer advisers in more than twenty-five departments to help students find the answers to their questions about major requirements, courses, and University regulations. The academic peer adviser complements faculty advising by providing a student perspective on the department. The Academic Peer Advising staff is trained to provide information and assistance concerning graduate schools, career opportunities, and college requirements. For more information contact the main APA office in 109 South Hall, 752-3000.

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

The **Orientation and Summer Advising Office** provides coordination for the Summer Advising and Registration Program, Fall Quarter Orientation activities, Preview Day, and many other student assistance and orientation programs for new students. The staff seeks to help students learn about the campus environment, procedures, and opportunities, and to offer programs relevant to students' changing needs. Your contribution to orientation programs, through ideas and assistance, is always welcome. The Coordinator's office is located in 109 South Hall, 752-3000.

The **Pre-Business School Adviser,** 359 Kerr Hall (752-6512 or 752-3000), is a student peer adviser who can assist you in seeking information about graduate schools in business, management, and public administration. This office also works with students who are in the process of applying to graduate school in business and distributes the Graduate Management Admission Test (GMAT) booklet. There is a useful library of business school catalogs and an informational handbook available.

The **Pre-Law Advising Office** is the place students interested in legal careers can come for information. The staff can advise you about admission requirements and program planning. The office maintains a reference library of law school bulletins, legal assistant information, admission test materials, and general career information. Many seminars and workshops are also held each year to provide students with more information for preparation for law school and a legal career. The Pre-Law Adviser may be contacted in 109 South Hall, 752-3009.

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

Counseling Center

Information:
219 North Hall
752-0871

The Counseling Center offers professional and peer counseling through psychological services, The House, and the EOP/SAA Information Office. Counselors help students deal with personal concerns, problems in interpersonal relations, and questions that arise in choosing an academic major or clarifying vocational

goals. In an atmosphere of understanding and confidentiality, individual feelings, values, and concerns can be explored.

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

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

Students can see counselors through the walk-in service or make a one-hour appointment to fit their schedules.

The House

Temporary Building 16 (next door to the Housing Office)
24-Hour Hotline: 752-2790
Business Line: 752-5665

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

Also offered are a variety of workshops and support groups, training in basic counseling and communication skills, and free tea and coffee.

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

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

Information:
311 North Hall
752-3472

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

The peer staff is an invaluable academic resource for students and is particularly sensitive to their social, cultural, and ethnic backgrounds and concerns.

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

EOP/SAA Tutoring (Learning Skills Center, The Basement, South Hall, 752-2013) is a free service for EOP and affirmative action students. If you are having difficulty with your course work, the Learning Skills Center offers tutoring in most course areas. Tutoring is provided on a one-to-one basis, with primary emphasis on the assignments in classes you are taking. However, tutorial services may also be used to improve study habits and learning skills. The tutoring program is staffed by

"The advising programs—faculty, peer, professional, career—are the best I've seen at any school."

- Junior, Business Management & Environmental Systems Analysis

students carefully selected for both their knowledge of course content and their sensitivity to the needs of students being tutored.

Special Transitional Enrichment Program (STEP) (Learning Skills Center, The Basement, South Hall, 752-2013). New EOP/SAA students (freshmen and transfers) admitted by special action are expected to participate in the Special Transitional Enrichment Program (STEP). The program begins in summer and continues through the first academic year, providing preparatory course work and developing academic skills. It helps students adjust academically and socially to the campus by strengthening their learning skills and study habits, and by providing an extensive orientation to campus life.

Learning Skills Center (LSC)

Information:
The Basement, South Hall
752-2013

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

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

In addition to the above areas of assistance, the Center provides individual tutoring sessions to various segments of the student population: members of the underrepresented ethnic groups, handicapped students, veterans, and students on academic probation or subject to dismissal. Group and drop-in tutoring is available to the general student body.

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

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

Academic Reentry Program

Information:
175 Mrak Hall
752-2971

If you are a nontraditional student, you can find help through the Academic Reentry Program. Preadmission and reentry advising are offered. The Program's resource area contains information on major programs, and staff is available to discuss ways of combining past study with future academic and career goals. Referrals to major advisers and campus services are made. Students reentering at the graduate level can receive special assistance in the Office of the Graduate Division. The Veterans Affairs and Community Housing offices can be of help in the reentry process.

Once admitted, the campus provides additional assistance with an orientation to campus life through Advising Services and through study skills workshops at the Learning Skills Center. Financial Aid offers workshops and a special packet for reentry students. The Work-Learn and Career Planning and Placement Center offers special career advising. The Counseling and Women's Resources and Research Centers are places where reentry students can share common interests and concerns through support groups.

STUDENT SERVICES

Student Health

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

Your health is important to you and to the University. Consequently, every new full-time student and every full-time student who returns after an absence must file, in person, a medical history form, evidence of rubella immunity, and the results of a tuberculin skin test at the Health Center as part of registration. A medical evaluation of the information on the form is then made in order to safeguard your health and the health of the University community.

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

The services of the Health Center are made possible, for the most part, by your registration fees. As a regularly enrolled student paying full registration fees, you are entitled to such outpatient and inpatient medical care as the Health Center is staffed and equipped to provide from the first day of the quarter through the last day of the quarter or to the date of official withdrawal.

Some of the Health Center services and facilities are:

- General outpatient and hospital care
- 24-hour emergency service
- Regularly scheduled clinics
- Major and minor surgery facilities
- X-ray, laboratory, and pharmacy services
- Physical therapy facilities
- Contraceptive information

The Health Center does not assume the responsibility for treating chronic physical defects, illnesses present at the time you enter the University, dental problems, or non-emergency remediable disorders.

When, in the opinion of the Health Center's director, a serious illness or injury obviously prevents you from continuing class work during the current quarter, you will be returned to your community or home for definitive treatment.

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

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

Health Education. Because maintaining good health is vital for the successful pursuit of your educational goals, Student Health's Health Education Program provides information and services in the areas of nutrition, exercise, sexuality, stress management, and drug and alcohol use. The Program is located in the Student Health Trailer Annex. Telephone 752-1151 or 752-6335 for information.

International Student Services (SISS)

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

The UCD campus currently has a community of international students and scholars from approximately 90 countries studying, teaching, and researching in a wide variety of fields. Assistance for international students and scholars at UC Davis is provided by the staff of Services for International Students and Scholars.

The functions of the SISS Office are to assist incoming international persons in preparing to come to the U.S., to monitor their legal status after arrival, to provide them with financial information, and to facilitate the international transfer of money in order to help them maintain their academic enrollment. Advising and counseling services, orientation, and intercultural activities are provided while at UCD.

Prior to Fall Quarter registration, a special orientation program is held for new international students. The program provides assistance with registration, class enrollment, housing, cultural orientation and immigration regulations as well as an introduction to campus services and community resources. All new and transfer international students are urged to attend this program.

Careful budgeting is essential for international students. A minimum allowance of $12,530 per year for a single student is recommended to cover nonresident tuition and fees, and living expenses (see page 35). A married student must budget an additional $2,500 per year for a spouse and $1,000 for each child accompanying the family.

The University of California, Davis, expects the international student to be responsible for the above costs. Prior to admission, the student must complete the Certification of Finances form certifying availability of funds

"Athletes are dedicated not only to their sport, but also to their schoolwork . . . Most students are involved in some type of athletic program or extra-curricular activity and not just buried in their school-work—contrary to popular belief."

- Senior, Biochemistry

for *twelve* months. Prior to registration, the student will be required to sign either the Statement of Responsibilities for Privately Funded Student or the Statement of Responsibilities for Sponsored Student. It is also important to note that tuition and fees may be increased without advance notice.

The international student should be cautioned that there will be numerous initial expenses during the first few months including cleaning and rent deposits for housing, telephone installation costs, bedding and cooking utensils, etc.

No financial aid is awarded by the University to international students during their first year of study. After the first year of attendance, very little financial aid is available to international students, and it is probable that in the near future, *no aid* will be available to them. Therefore, international students must be prepared to pay their expenses for the entire length of their stay at UC Davis.

Students are obligated to report to Services for International Students and Scholars as soon after their arrival as possible. This office can help with immediate needs, make introductions to the Davis international community, and assist students and scholars in locating other individuals from their home countries.

Services to Handicapped Students

Information:
Services to Handicapped Students (SHS)
101 Silo Student Center
752-3184 (voice)
752-6889 (telephone device for the speech and hearing impaired)

If you have a physical disability, either permanent or temporary, you may find the advice, assistance, and specialized resources available from the Services to Handicapped Students Office very useful. Disabled people established this resource program to help students manage physical limitations in order to achieve maximum participation in campus life. You can establish a partnership with experienced SHS staff to accommodate your individual circumstances and to explore and develop alternatives for expanding your own choices.

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

Educational support includes specialized academic advising, emergency educational equipment loans, tutoring services, library resource areas with specialized equipment, and arrangements for locating and funding readers, notetakers, and clerical or research assistants. SHS also arranges for sign language and oral interpreters for academic needs. Other resources include:

- Priority registration and enrollment in classes
- Educational support equipment—reading machine; reading, taping, and television aids for visually impaired; amplification equipment; adaptable computer and access devices; etc.

- Orientation tours and mobility advising for maximum independence
- Repair services for wheelchairs, mobility, and other specialized equipment
- Emergency loans of electric carts and wheelchairs
- Accessible transportation services including an on-campus shuttle

Most architectural barriers to participation in campus activities have been removed. Accessible on-campus housing is available, as well as a campus map showing physical accessibility features. Most of the campus is flat and has a good curb ramp system. Ease of mobility, plus special class scheduling methods, can better ensure that you'll make it from one class to another on time. Accessible buses link the campus with the community of Davis.

Preadmission counseling is available to individuals with disabilities. You are encouraged to contact the SHS Office if the circumstances of a physical disability seem

to prevent you from demonstrating your ability to do University work or completing the subject or examination requirements for admission.

Veterans Affairs

Information:
Veterans Affairs Office
200 Silo
752-2020

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

To initiate a benefit claim, write the Veterans Affairs Office or drop by 200 Silo with your letter of admission, preferably before registration. The office can give you forms, information, and advice, and will also certify your attendance to the Veterans Administration. Remember to visit the office each quarter (bring your validated registration card for recertification) in order to avoid any delay in receiving benefits. If other delays occur, the office will help resolve the problem.

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

Selective Service Information

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

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

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

If you are confused or unsure of your current Selective Service status, the office can help by offering information, assistance, alternatives, and support.

Women's Resources and Research Center (WRRC)

Information:
10 Lower Freeborn
752-3372

The Women's Resources and Research Center serves the UCD community by providing information and programs aimed at increasing awareness of the educational, career, and personal needs of women. WRRC's services are wide-ranging and include:

- Workshops, lecture series, forums, conferences, and events on issues of particular interest to women
- Classes in assertiveness training
- Problem-solving groups
- Resource files and referrals for birth control information, marital problems, legal rights, legislation, child care, sexuality, mental health, health care, employment
- Original research on sex roles and women's concerns
- Research consultation (assistance with designing and conducting research on women and sex roles)
- Assistance in obtaining academic credit; help in finding faculty members to sponsor 198, 199, and 299 courses

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

The Women's Studies major and minor programs are administered at the WRRC. For information and program advising, see page 325 of this catalog or telephone 752-3307.

The Center is staffed by professionals and student interns. You are encouraged to drop by and talk with

"The campus is filled with resources and I've found that people will really bend over backwards to help you out."

- Senior, Biochemistry

the staff. Internships are available in legislative work, publicity, program planning, and graphic arts.

Student Employment

Information:
Student Employment Center
1st floor, South Hall
(916) 752-0520

Need a part-time job to get yourself through school? Do you occasionally run short of funds or need a few extra dollars for a special weekend event? Or are you looking for experience in a job that is related to your major? If so, the Student Employment Center can probably assist you.

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

A wide variety of employment opportunities are offered on campus and in Davis and the adjacent communities. Part-time and temporary full-time positions are available during the school year and vacation periods. New listings are posted twice daily. Extensive listings of summer opportunities in government agencies, camps and resorts throughout California are located at the Center and students are encouraged to begin in January looking for summer employment.

The Center is open from 8:30 to 11:45 a.m. and 1 to 4 p.m.

Career Planning and Placement

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

Worried about your career plans? Do you know what kind of 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 Work-Learn and Career Planning and Placement (WL/CPP) can help you.

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

Some of the resources you can find here include:

- Individual career advising and group seminars
- Workshops on resume writing, interviewing, and job-seeking skills
- Seminars to explore career fields and employment trends
- A Career Resources Library
- System of Interactive Guidance and Instruction (SIGI), self-help computerized guidance system which aids in values clarification and career decision making
- A manual for job-seekers
- Listings of current job vacancies
- Internship opportunities (applied work experiences) in all career areas

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

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

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

Education and Graduate Placement Services

Any student enrolled in the teaching credential program or pursuing a master's or doctoral degree in order to teach, should register with the Education and Graduate

Placement Office. Services include:

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

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

CHILD CARE PROGRAMS

Seeking assistance with child care? The following programs are available on campus and in the community to assist students and staff in meeting their child care needs.

- The City of Davis Child Care Services Office provides free child care referral and information, and some child care subsidies. The office is funded jointly by the University of California, Davis, the City of Davis, and the State Department of Education. Up-to-date information is maintained regarding preschools, day care homes, child care centers, babysitting co-ops, playgroups, and other family related services. It is located at 23 Russell Boulevard (756-3747, extension 300).
- The Office of Financial Aid assists student parents who qualify for financial aid with allowances for dependent children (food, clothing, housing, basic medical costs), direct child care costs (babysitting or child care center charges), and unanticipated medical expenses. This office is located on the first floor of North Hall on campus (752-2390).
- The Early Childhood Laboratory is a teaching and research facility associated with the Human Development Program. Four different programs accommodate children from the ages of 6 months to 5 years. Enrollment is limited. The laboratory is located on campus, and the office is in Temporary Building 117 (752-2888).
- Student family housing resident parent associations sponsor on-campus playgroups in Orchard Park and Solano Park. Morning sessions are held in each area for children ages 2 to 5 years. Participation is limited to family-housing residents. For further information or referral telephone 752-4000, Orchard Park/Solano Park, Student Family Housing Office.

CAL AGGIE ALUMNI ASSOCIATION

Information:
The Alumni Center
University House
752-0286

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

The Association and its alumni members have aided the Davis campus through support and sponsorship of many activities and programs including the Alumni Scholarship Program, Alumni Weekend, Picnic Day, the UCD Annual Giving Program, legislative relations programs, and a student loan fund. In addition, the Association maintains a professional staff dedicated to meeting the needs of UCD's more than 65,000 alumni.

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

"The intramural sports program at UCD is outstanding. Virtually any student can find some sport to participate in."

- Senior, Zoology

Fees, **E**xpenses and **F**inancial **A**id

FEES AND EXPENSES

It is extremely important to consider carefully the total financing of your University education. If you will need funds beyond those that you and your family can provide, you should apply for aid well in advance of enrollment. The deadlines for financial aid (grants, loans, work-study, and scholarships) can be found in the following pages.

While the needs and resources of each student are different, the following information will give you an idea of the basic expenses students at UCD will incur. Legal residents of California are not required to pay tuition at the University. Students classified as nonresidents must pay tuition of $1,188 per quarter. (See page 333 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	$170.00	$170.00
Memorial Union	3.50	3.50
Associated Students fee	14.50	
Graduate Student Association fee†		4.50
Education fee‡		
Fall and Winter (each quarter)	241.00	261.00
Spring (quarter)	240.00	260.00
Total for California residents		
Fall and Winter (each quarter)	**$429.00**	**$439.00**
Spring (quarter)	**$428.00**	**$438.00**
Tuition for nonresidents‡	1,188.00	1,188.00
Total for nonresidents		
Fall and Winter (each quarter)	**$1,617.00**	**$1,627.00**
Spring (quarter)	**$1,616.00**	**$1,626.00**

These fees are for the 1984-85 academic year and are subject to change without notice.

Additional Fees and Expenses

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

Parking (per year: $36 to $48 for cars, depending on the type of permit; $18 for motorcycles; $7 for nighttime only permit)

Bicycles, fee for the required California State License (initial license, $6, and renewals, $3)

Late payment registration fee ($50)

Changes in class schedule after announced deadline ($3, each petition)

Transcripts ($3 for the first and $1 for each additional copy requested at the same time)

Diplomas can be mailed to an address left with Registrar's Office (fee varies with current mail costs)

Applications for readmission, Planned Educational Leave, or intercampus transfer ($35)

For details concerning fees and deposits, consult the publication *1984-85 Student Fees and Deposits,* available from the Registrar's Office. Current fees are also published in the *Class Schedule and Room Directory.* **(Fees are subject to change without notice.)**

Explanation of Fees and Expenses

University Registration Fee: $170 per quarter; $255 per semester for law students. Revenue from this fee is used to support a portion of the cost of student services programs including recreational services (MU and Rec Hall), counseling and advising services, career planning and placement services, student organization and activities services, Learning Skills Center services, and health services. The health services portion of the fee can be treated as a medical expense deduction from income tax.

Education Fee: $241 Fall and Winter Quarters and $240 Spring Quarter for undergraduates; $261 Fall and Winter Quarters and $260 Spring Quarter for graduate students; $391 per semester for law students. Revenue from this fee is used for financial aid and related student programs.

Nonresident Tuition: $1,188 per quarter; $1,782 per semester for law students (see the nonresident tuition fee statement on page 333).

Memorial Union: $3.50 per quarter; $5.25 per semester for law students. Paid by all students.

Associated Students Fee: $14.50 per quarter. All undergraduate students, both full-time and part-time, are represented by the Associated Students of the University of California, Davis (ASUCD). Graduate and professional students may receive access to all services and activities by paying the fee (see also Graduate Student Association Fee following).

Graduate Student Association Fee: $4.50 per quarter. Paid by all academic graduate students, including students in the Graduate School of Administration, but not mandatory for professional students in the Schools of Law, Medicine, and Veterinary Medicine. Professional students may have access to the same services and activities by paying the fee.

Law Student Association Fee: $5 per semester.

Costs for a Year at UCD

The Financial Aid Office estimates that the average 1984-85 expenses of a single UCD undergraduate living off campus will total $6,320, including $1,286 for fees, $414 for books and supplies, $1,891 for housing, $1,577 for food, $807 for personal expenses, and $345 for transportation. Estimated expenses for other single students are: graduate students, $6,717; Graduate School of Administration, $6,955; Law, $6,848; Veterinary Medicine, $7,041 to $7,619, depending upon the year in school (first, second, etc.); Medicine, $7,355 to $8,682, depending upon the year in school. For married students, these categories range from an undergraduate low of $9,791 to a high of $12,737 for second-year students in the School of Medicine.

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

† Students in the Schools of Law, Medicine, and Veterinary Medicine are not included (see the explanation of fees following).

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

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

Transportation

Transportation is included in the cost of living estimates given above. See pages 7 and 35 for an idea of what types of transportation are available. Information on automobile parking and bicycle regulations can be obtained through the Parking Operations Office located in the Police Department on campus (752-0659). Car pools are encouraged and the Car Pool Information Office (752-MILE) can help you find a ride or riders.

FEE REFUNDS

If you have to withdraw before the first day of instruction, you must fill out and return a "Cancellation of Registration" form to the Registrar's Office, along with your validated Registration Card. After the first day of instruction, you must 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 Readmitted Students and New Graduate Students:
There is a service charge of $10 for cancellation of registration or withdrawal before the first day of instruction. After the first day of instruction the Schedule of Refunds is applied to the total of fees assessed.

Schedule of Refunds

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

University Registration Fee, Education Fee, Nonresident Tuition and other student fees:

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

FINANCIAL AID

Information:
Financial Aid Office
1st floor, North Hall
(916) 752-2390

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

To ensure priority consideration, you should file your application for the 1985-86 academic year no later than *February 7, 1985* (see heavy-faced note below). Due to limited funds, students who miss the priority filing date may not be able to receive assistance. You are still encouraged to apply for financial aid, even if it is after the priority deadline. Application instructions for prospective undergraduate students are contained in the *UC Undergraduate Admissions and Financial Aid Packet.* Continuing UCD students and prospective graduate students should obtain application forms and instructions from the Financial Aid Office in December 1984. Exact deadlines will be announced in application materials.

Undergraduates with outstanding academic records are encouraged to apply for scholarships. Scholarship applications for the 1985-86 academic year are available in October and must be filed by *January 11, 1985.* (See the Scholarship section beginning on page 39.)

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 98).

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

For more information about awarding of financial aid, contact the Financial Aid Office. **(Note: Regulations and deadlines are subject to change.)**

TYPES OF FINANCIAL AID

Grants

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

Pell Grants are federally funded awards. All undergraduate financial aid applicants are required to apply for a Pell Grant each year by following the instructions in the financial aid application packet. Recipients must be enrolled at least half-time and must maintain good academic standing and make satisfactory academic progress. Eligibility for a Pell Grant is determined by the federal government according to a formula developed by the Department of Education and approved annually by Congress. All applicants are notified via a document, the "Student Aid Report" (SAR). The SAR must then be submitted to the UC Davis Financial Aid Office.

- Amount depends on financial need

Supplemental Educational Opportunity Grants are awarded to U.S. citizens or permanent U.S. residents who are at least half-time students in good academic standing and demonstrate exceptional financial need while pursuing their first undergraduate degree.

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

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

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

- Cal Grant A pays all or a portion of the registration fees
- Cal Grant B pays all or a portion of the registration fees plus a monthly stipend for living expenses

University Grants are available to both graduate and undergraduate students, with the exception of Educational Opportunity Program (EOP) Grants, which are restricted to undergraduates.

- Maximum varies each year depending on funds available

Bureau of Indian Affairs (BIA) Grants are awarded to students who are at least one-fourth American Indian, Eskimo, or Aleut, as recognized by a tribal group served by the Bureau of Indian Affairs and who show financial need. Applicants must submit a regular financial aid application and provide supporting documents to the campus. In addition, applicants should write to the agency which administers their tribal affairs and request a BIA Higher Education Assistance application. An appointment may be made with the BIA Financial Aid Counselor on campus for assistance in completing the application.

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

Loans

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

University Student Loans of up to $12,000 per student are available. If graduate studies are undertaken, payment may be deferred until completion or termination of studies. (Cosigner is required for annual amounts above $1,000.)

- $3,000 undergraduate maximum for first 2 years
- $6,000 undergraduate maximum during 4 years
- $12,000 maximum for graduate students, including loans taken out as undergraduates
- 5 percent interest (subject to change)
- Repayment begins 6 months 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 six months after graduation or withdrawal from school and may be extended over 10 years. Under certain circumstances, deferment is possible. For example, deferments may be granted for temporary total disability or volunteer service in a private, non-profit organization (VISTA or Peace Corps). Some teachers of students from low-income families, and full-time teachers of handicapped children, may also qualify for partial loan cancellation.

- $3,000 undergraduate maximum for first 2 years
- $6,000 undergraduate maximum during 4 years
- $12,000 maximum for graduate students, including loans taken out as undergraduates
- 5 percent interest (subject to change)

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

- $2,500 maximum for veterinary medicine and first-year medical students
- $3,333 maximum for second-, third-, or fourth-year medical students
- 9 percent interest
- Repayment begins 12 months after receipt of the degree or withdrawal

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

- $20,000 maximum per academic year
- $80,000 total maximum
- The HEAL Program does not provide a subsidy payment for interest
- Interest may vary depending on Treasury bill rates
- Repayment begins 9 months after completion of formal training, including accredited internship and residency programs, or withdrawal

Guaranteed Student Loans (GSLs) are available through banks and other lending institutions. These loans may be need-based, depending on federal regulations. Interest accrued while in school is paid by the federal government. This program requires a separate application, which is available in the Financial Aid Office. (The GSL program is subject to frequent changes.)

- $2,500 maximum per year for undergraduate students
- $5,000 maximum per year for graduate students
- 8-9 percent interest (may change on short notice)
- Repayment begins 6 months after graduation or withdrawal

California Loans to Assist Students (CLAS) are government-insured loans that are made to parents of dependent students and to independent undergraduate students, and graduate or professional students by participating banks and other lenders, regardless of income and assets.

- Parents of dependent students may borrow $3,000 per year up to a maximum aggregate of $15,000 for each dependent student
- Independent undergraduate students may borrow $2,500 per year, less any amount received as GSLs, up to a maximum aggregate under both programs of $12,500
- Graduate/professional students may borrow $3,000 per year up to a maximum aggregate of $15,000
- 12 percent interest (subject to change)
- No interest subsidy for this loan
- Repayment begins 60 days after loan disbursement

Short-Term, Emergency, and Teaching Assistant Loans are designed to meet temporary emergency financial needs of registered students. Loans are provided by UCD alumni, ASUCD, the Cal Aggie Foundation, The Regents of the University of California, and private donors. Apply at North Hall.

- Short-term loan: $200 maximum; the full amount of in-state registration fees for one quarter may be borrowed only in the form of a fee exchange voucher
- Emergency loan: $50 maximum
- Teaching assistant loan: students who are in the teaching assistant, research assistant, associate in, and postgraduate researcher classifications can apply for a maximum of one month's salary prior to and during Fall Quarter

Employment

The **College Work-Study Program** enables students to earn part of their financial aid award by part-time employment. To participate, you must first be awarded Work-Study as a part of your financial aid package. Your Work-Study award contributes more than financial assistance for your college education. It offers you a double bonus—money for your education plus experience. In increasingly competitive job markets, employers want applicants who are qualified by employment as well as academic experience. College Work-Study is coordinated by the Student Employment Center (see below).

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

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

The **Student Employment Center** helps students and their spouses find both part-time and temporary full-time employment on and off campus during the school year and vacation periods. Job opportunities are available in many fields of interest and require a wide range of skills, from entry level to highly technical. For further information, see the Student Employment Center section on page 32.

SCHOLARSHIPS AND AWARDS

Information:
Scholarship Office
130 North Hall
(916) 752-2393

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

Scholarships are awarded on the basis of academic excellence and exceptional promise. Recipients are chosen by committees made up of both students and faculty. In addition to academic records (a minimum grade-point average of 3.25 is required for college students, 3.5 for students submitting a high school transcript), selection is based on a letter of recommendation and a personal essay in which your University goals and objectives are stated. *Some awards may be limited to students in specific majors or colleges, residents of certain geographical areas, students of a particular class standing, or students with demonstrated financial need.* Most scholarships are not renewable and you must re-apply each year for scholarship aid.

Applications for scholarships are available at the start of each Fall Quarter for the following academic year. Deadline for submission of application materials is *January 11 for academic year 1985-86.* Announcement of winners is usually made beginning in mid-April. A Scholarship Office flyer provides more detailed information about scholarships.

Graduate students are also eligible for various scholarships and fellowships. (See also page 98).

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 $300 per year 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 Administrative Committee conducts personal interviews during the final selection process. These scholarships are renewable as long as you maintain a 3.25 grade-point average.

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

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

- $500 maximum
- New undergraduates only
- Selection by local Alumni Association chapters

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

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

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

- Generally $100 to $1,200

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

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

Admission

Information:
Undergraduate Admissions Office
175 Mrak Hall

(916) 752-2971
(916) 752-6889 (telecommunication device for the speech and hearing impaired)

APPLYING TO UC DAVIS

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

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

Application and admission procedures are outlined beginning on page 43. A summary of the steps in the application procedure appears on page 52. Use this checklist to follow your application through the admissions process.

The Services to Handicapped Students Office encourages applicants with a physical impairment to contact that office (see page 30) for further information concerning admission or assistance if needed.

Office of Relations with Schools/EOP Outreach Services

Information:
11 Mrak Hall
(916) 752-1099

The Office of Relations with Schools/EOP Outreach Services is the University's link with secondary schools and community colleges within the state. Services and programs provided by the office include:

- Visiting schools to provide information about UCD to prospective students, counselors, school administrators, teachers, and parents
- Presenting conferences to acquaint the public with University programs
- Developing and distributing publications describing UCD's programs and academic majors
- Coordinating information about course equivalencies and credit between the community colleges and UCD
- Administering a recruitment program designed to attract minority and low income students to the University

The Educational Opportunity Program/Student Affirmative Action (EOP/SAA) is a major effort of the Office. These special programs in the junior high schools, high schools, and community colleges are aimed at encouraging students from under-represented groups to become eligible for regular admission to the University.

Programs include *The Partnership Program's* "Early Outreach" in the junior high schools and high schools, and "Immediate Outreach" in the high schools and community colleges; the *Academic Enrichment Program,* which provides encouragement for students to take science and mathematics courses in high school; and *UPWARD BOUND,* a pre-college motivational program in the high schools. The office also sponsors summer residential programs on the Davis campus to give students the opportunity to experience the diversity of University life through residence hall living, special classes, trips, and lectures.

VISITING THE CAMPUS

Information:
Information Services Office
129 Mrak Hall
(916) 752-0539

You may wish to arrange a visit to UC Davis sometime before you apply. If you have specific questions about application procedures or entrance requirements, it is a good idea to write or visit the Undergraduate Admissions Office. No appointment is necessary. For scheduled or individual tours of the campus, contact the Information Services Office, either in person or by telephone. If you would like to visit classes, the Information Services Office can make the appropriate arrangements.

PREPARING FOR UNIVERSITY WORK

A carefully planned program of high school courses provides you with the best preparation for University work. It can give you a definite edge in your undergraduate studies and the opportunity to do advanced preparation for your chosen field of study. Most important, if you master certain basic subjects and skills in high school, you substantially increase your chance of success at the University.

As a prospective University student, you should give priority to completing the high school courses required for admission—the "A-F" requirements described on page 46. In addition, you should give careful thought to the general field of study, if not the specific major, that you want to pursue at the University. If you can make this decision in advance, you can then plan to take additional high school courses related to your field. Your school counselor or one of your teachers can help you select the courses you should take.

"As a transfer student, I worried about making the grade at a four-year college. By accepting me UCD demonstrated its faith in my ability to achieve."

- Junior, Political Science

Admission

You should understand that the "A-F" requirements for admission are *minimum* entrance standards. Completing the required high school courses with satisfactory grades will not automatically prepare you for freshman work in every subject, much less in your major or program of study. Many entering students discover to their dismay that they are not adequately prepared for basic courses, such as English composition and calculus, which they are expected to take in their freshman year. Also, many undergraduate majors, particularly those in sciences and mathematics, require more high school preparation than that necessary for admission. This lack of preparation can cause problems for students who do not choose a major until after they enter the University, or for those who prepare for one major but later decide to change to another.

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

Reading: Many students are not prepared for either the kinds or amounts of reading demanded of freshmen at the University. You should become proficient in reading and understanding technical materials and scholarly works. You should learn to read analytically and critically, actively questioning yourself about the author's intentions, viewpoint, arguments, and conclusions. You should also become familiar, and comfortable, with the conventions of standard written English, and with various writing strategies and techniques. Your reading experience should include original works in their entirety, not just textbooks and anthologies, and should encompass a wide variety of forms and topics.

Writing: Effective critical thinking and proficiency with the written language are closely related, and both are skills which every University student must master. By University standards, a student who is proficient in English composition is able to: a) understand the assigned topic; b) select and develop a theme by argument and example; c) choose words which aptly and precisely convey the intended meaning; d) construct effective sentences, i.e., sentences that economically and successfully convey the writer's ideas and display a variety of structures; e) demonstrate an awareness of the conventions of standard written English, avoiding such errors as sentence fragments, run-together sentences, faulty agreements, and improper pronoun references; and f) punctuate, capitalize, and spell correctly.

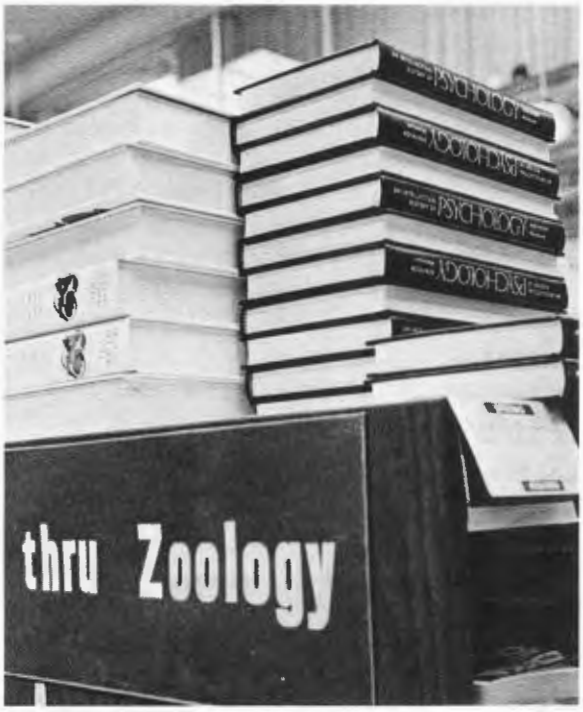
If you plan to attend the University, you must take English courses in high school that require the development and practice of these skills. You must take at least four years of English composition and literature that stress expository writing: the development of persuasive critical thinking on the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

Mathematics: Many undergraduate majors require preparation in mathematics beyond the two years necessary for admission to the University. All majors in the natural and life sciences, engineering, and mathematics require preparation for calculus. Many majors in the social sciences, for example, require preparation for statistics or calculus, sometimes both. If you have selected a major that requires either calculus or statistics, you should expect to take that course during your freshman year at the University, and take the necessary mathematics in high school.

Calculus is also required for undergraduates preparing for careers in environmental sciences, dentistry, medicine, optometry, pharmacy, and biostatistics. Many students are not aware of the large number of fields outside the natural and mathematical sciences which require calculus or statistics as prerequisites.

You should prepare yourself for University courses in calculus while you are still in high school. In addition to the two years of mathematics required for admission, you should take a second year of algebra and a year of precalculus mathematics. These courses should include: a) operations with numerical and algebraic expressions including fractional exponents and radicals; b) solution of linear and quadratic equations and inequalities; c) polynomial equations and functions; d) equations and functions involving rational expressions; e) exponential, logarithmic and trigonometric functions; f) conic sections; g) polar coordinates; h) lines, planes, vectors in space; i) sequences and series; j) the binomial theorem; and k) applications and word problems. Students who plan to enter a field which requires statistics should take at least the second year of algebra in high school.

If you are not proficient in basic and intermediate algebra, you will be at an enormous disadvantage in the University. You will have to take one or more precalculus courses before beginning calculus, and may also have to take preparatory courses before beginning statistics. The necessity to take these preparatory courses could seriously delay your undergraduate studies.



APPLICATION PROCEDURES

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

A nonrefundable application fee of $35 must accompany your application. Please make your check payable to The Regents of the University of California. If you have applied previously and were ineligible, or if you were admitted previously and did not register, you are required to file a new application for the quarter for which you seek admission and submit a new application fee.

Opening filing dates are the same for all UC campuses and are listed below. All applications filed during the first month of the filing period will be accepted for consideration. This campus may continue to accept applications beyond the initial filing period; however, after the first month, some departments, colleges, or campuses may close to new applicants as enrollment quotas are filled. Once a department, college, or campus has closed, any additional applications which are received will be returned to the applicant.

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

Quarter to be Admitted	Opening Date of Filing Period
Spring 1985	October 1, 1984
Fall 1985	November 1, 1984
†Winter 1986	July 1, 1985
*Spring 1986	October 1, 1985

*An applicant seeking admission to the Spring Quarter may not enroll in any semester-system school for the Spring Semester immediately preceding the UCD Spring Quarter.

†An applicant seeking admission to the Winter Quarter may not attend fall sessions at schools whose final fall grades will not be available before the beginning of Winter Quarter at UCD.

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

Duplicate Applications

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

Note: An exception, however, is if you are applying to a College (school, or department) of Engineering, you may submit an application to more than one campus. The application fee and complete transcripts and test scores must be submitted to each campus to which you apply.

Transcripts and Test Scores

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

If you are in high school when you apply, please request that your high school send an official transcript of all work completed through your junior year directly to the Undergraduate Admissions Office. This preliminary transcript should also include a list of work in progress (senior-year courses in which you are currently enrolled or plan to complete before graduation). In addition, you must also submit a final transcript including a statement of graduation, a Certificate of Proficiency or a General Education Development (GED) certificate (see page 51). Freshman applicants (see "Explanation of Application Categories") are also required to submit results of their SAT or ACT tests *and* three Achievement Tests (see page 47).

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

Change of Campus Choice

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 to the Admissions Office of the campus you prefer to attend. In your letter to the new campus, you should state (1) your intended major, (2) the quarter for which you are applying, (3) the level for which you are applying (i.e., freshman or advanced standing),

(4) the name of the campus to which you originally applied, and (5) the reasons for your change. The new campus will ask the Davis campus to transfer your records, provided the new 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 is made. You should be aware that special program commitments (such as the EOP/SAA or UCLA's Academic Advancement Program) do not transfer from one campus to another.

If you requested housing or financial aid information at UCD, you should inquire of the new campus housing and financial aid offices whether pertinent records have been transferred and about the new campus's priorities, deadlines, and availability of financial aid and housing.

Notification

After returning your application materials you may be wondering,

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

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

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

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

Acceptance of Admission

When you receive your notification of admission you will also receive an important form called the "Statement of Intention to Register" (SIR). You must fill out the form and return it to this office, along with the required nonrefundable $50 deposit, in order to complete the admissions process. There is no specific deadline for submitting your SIR; however, if you plan to attend the Summer Advising Conference, you should submit this form by the end of April. The deposit is applied to your University Registration Fee as long as you register in the quarter to which you are admitted. Intercampus transfer, EOP/SAA, and readmission applicants (see *Explanation of Application Categories* below) are not required to submit the $50 deposit.

EXPLANATION OF APPLICATION CATEGORIES

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

A **freshman** applicant (page 45) is a student who has graduated from high school or who has earned a Certificate of Proficiency or a General Education Development Certificate, 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 (transfer)** applicant (page 48) is a student who has been registered in a regular or extension session of a college or university since high school graduation.

An **intercampus transfer** applicant (page 50) 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 **intercampus transfer reentrant** applicant is an undergraduate who was formerly registered at UC Davis, then registered at another UC campus, and is now transferring back to UC Davis from a UC campus. This student follows the filing deadlines established for readmission applicants.

An **Educational Opportunity Program/Student Affirmative Action** applicant (page 49) is a low-income or minority student who may or may not meet the standard admission requirements for freshman or advanced standing status.

A **readmission** applicant (page 55) is a student who was formerly registered on the Davis campus, who has interrupted the completion of consecutive quarters of enrollment and who is not currently participating in the Planned Educational Leave Program. (See page 50 for reentry for the nontraditional student.)

A **reentry** applicant is an undergraduate student age 25 or over or a graduate student age 30 or over (see page 50).

A **limited status** applicant (page 50) 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 50) 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 **part-time status** student is a person who wishes to complete a degree at UC Davis on a part-time enrollment basis. See page 51 for details.

Employee-student status is for a UC career employee who wishes to work toward a degree through the Employee Reduced Fee Program. See page 51 for details.

A **second baccalaureate** applicant (page 50) is a college graduate who seeks an additional bachelor's degree. Approval is granted only to students who have completely changed their educational objectives and are applying for a major that has no enrollment restrictions.

An **international** applicant (page 50) is a student who is not a U.S. citizen, immigrant, or refugee.

A **concurrent enrollment** applicant (page 51) is a community member who wishes to fulfill an academic interest or to test academic ability by enrolling in a limited number of regular University courses on a space-available basis. This program is offered through University Extension and does not require the applicant to meet regular admission requirements.

A **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 95 for details.

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

UNDERGRADUATE STUDIES

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

The **College of Agricultural and Environmental Sciences** focuses on seven areas of concentration: animal science; plant sciences and pest and disease management; food, nutrition, textile, and consumer sciences; applied economic and behavioral sciences; resource sciences and engineering; environmental studies; and biological sciences (majors are listed on pages 68-69). The **College of Engineering** focuses its curricula on the engineering sciences (majors are listed on page 76.) The **College of Letters and Science** curricula encompass the humanities, including the arts, and the social, physical, and biological sciences. They enable the student to pursue fundamental knowledge and to learn those basic intellectual disciplines which lead to a liberal education (majors are found on page 85).

ENTRANCE REQUIREMENTS

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

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

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

ADMISSION AS A FRESHMAN

To be eligible for admission to the University of California as a freshman, you must meet specific **Subject, Scholarship, and Examination Requirements.** If you have any questions or need assistance in determining your eligibility, please contact your school counselor, the Office of Relations with Schools, or Undergraduate Admissions on the nearest UC campus. Final determination of UC eligibility is made by the campus Admissions Office.

Subject Requirement

You must complete certain high school courses in the subject areas listed below with at least a grade of C in each semester of each course. (If your school gives only year-end grades, you must complete each year course with a grade of C or better.) The required course sequence is often referred to as the "A to F" pattern.

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

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

A. History—1 year
One year of United States history, or one-half year of United States history and one-half year of civics or American government.

B. English—4 years
Four years of English—composition and literature (university preparatory in nature). Not more than one year will be accepted from the ninth grade. (See "English proficiency" below.)

C. Mathematics—2 years
Two years of mathematics—elementary algebra, geometry, intermediate and advanced algebra, trigonometry, calculus, elementary functions, matrix algebra, probability, statistics, or courses combining these subjects. Nonacademic courses such as arithmetic and business mathematics may not be used.

D. Laboratory Science—1 year
A year course in one laboratory science, taken in the tenth, eleventh, or twelfth grade.

E. Foreign Language—2 years
Two years of one foreign language. Any foreign language with a written literature may be used.

F. Advanced Course—1 or 2 years
This requirement must be satisfied by one of the following

- **Mathematics:** one year of advanced mathematics—intermediate algebra, trigonometry, or other comparable mathematics courses.
- **Science:** a year course in any laboratory science completed subsequent to the laboratory science used for "D" above.
- **Foreign language:** either an additional year in the same language used for "E" above or two years of a second foreign language.

The required courses listed above constitute only 10 or 11 of the total (15) units required for admission to the University. The remaining units provide an opportunity for you to strengthen your preparation for University work. Additional courses in mathematics, especially second-year algebra and trigonometry, are essential for many major programs.

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

English Proficiency

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

- College Board Achievement Test in English Composition (a score of 600 or above);
- Advanced Placement Examination in English Composition and Literature *or* English Language and Composition (a score of 5, 4, 3); or
- California State University and Colleges English Equivalency Test (a "pass for credit" only).

The requirement may also be satisfied with a 3-semester or 4-quarter unit transferable English course with a grade of C or higher in literature, composition, or speech.

Foreign Language Proficiency

The Department of Oriental Languages and Civilizations at UC Davis offers proficiency examinations in Chinese, Japanese, and Korean. Applicants to Davis who are proficient in one of these languages can satisfy the Foreign Language "E" requirement by passing an examination. For further information, contact the Undergraduate Admissions Office.

Scholarship Requirement

If you attain a grade-point average of 3.30 (where the letter grade A = 4, B = 3, and C = 2, and in honors or advanced placement courses taken during the eleventh and twelfth years—limit of four year-long courses—where the letter grade A=5, B=4, and C=3) in the required "A to F" subjects taken after the ninth grade, you will be eligible to enter the University regardless of your scores on standardized tests. If your grade-point average falls below 3.30 but higher than 2.77, you will be eligible for the University by achieving the specified scores on the standardized tests (see the Eligibility Index on the facing page). If you are a nonresident applicant, your grade-point average in the required subjects must be 3.40 or higher.

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

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

Examination Requirement

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

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

or

- American College Test

and

- Three Achievement Tests (CEEB), which must include (a) English Composition (with or without the essay), (b) mathematics (level I or II), and (c) one test from the social studies or science or foreign language, or the test in English literature.

If you are a California resident and your grade-point average in the required high school subjects is over 3.30, the tests are required but your scores will not be used to determine your eligibility.

The accompanying table is an eligibility index. If your grade-point average in the "A to F" requirement is less than 3.30 you should refer to this table to see what examination scores you must earn to be eligible for University admission.

Eligibility Index

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

*The American College Test (ACT) is scored in intervals of 1 point from a minimum of 1 to a maximum of 35.
†The Scholastic Aptitude Test (SAT) is scored in intervals of 10 points from a minimum of 400 to a maximum of 1600.

"Good study habits are the only thing that will get you ahead here, no matter how intelligent you are."

- Freshman, Physics

Admission by Examination Alone

If you do not meet the scholarship and subject requirements for admission and have completed fewer than 12 quarter or semester units since high school graduation, you can qualify for admission as a freshman by examination alone. (If you have completed transferable college courses, CEEB tests cannot be taken in academic subjects covered in those courses.) You must take the same CEEB tests discussed above and receive a total score of at least 1100 on the Scholastic Aptitude Test, or a score of 26 on the American College Test. Your total score on the three Achievement Tests must be 1650 or higher with no score less than 500 on an individual Achievement Test. If you are a nonresident applicant, your score on the three Achievement Tests must be 1730 or higher. High school graduation, a Certificate of Proficiency, or a General Education Development (GED) certificate is also required for students who qualify for admission by examination alone.

Examination Arrangements: Make arrangements to take the required Scholastic Aptitude Test (SAT) and the Achievement Tests by writing to The College Board, 1947 Center Street, Berkeley, CA 94704. For the American College Test (ACT) write to American College Testing Program, Registration Unit, P.O. Box 168, Iowa City, IA 52240. (Test fees should be paid to the Testing Service, not the University.) Your test scores will be regarded as official only if they are reported directly to the Undergraduate Admissions Office by a Testing Service. Your final notification of admission cannot be released until your scores from all tests have been received by the Undergraduate Admissions Office. (UC Davis's CEEB code is 4834 and the ACT code is 0454.)

ADMISSION TO ADVANCED STANDING

An advanced standing transfer applicant is a student who has been registered in a regular or extension session of a college or university since high school graduation. An advanced standing student may not disregard his or her previous college records. The Undergraduate Admissions Office determines an applicant's status by looking at units that are transferable to the University. These units may not be accepted by the Dean of your college for meeting breadth, major, or degree requirements.

Admission Requirements

The requirements for admission to advanced standing will vary according to your high school record. If you have fewer than 84 transferable quarter (56 semester) units, you may be required to submit a SAT examination score to establish your high school eligibility on the eligibility index. Transfers with more than 12 quarter or semester units are not required to submit achievement test results. In any case, if you have completed fewer than 12 units since high school graduation, the examination requirements for freshman applicants also apply. If you are a nonresident, you need to meet the additional requirements as described on page 50.

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 2.00 or better. If your grade-point average fell below 2.00 at any one college you attended or you are not in good standing, you may have to meet additional requirements in order to qualify for admission.

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

- If you have graduated from high school and have completed the "A to F" subjects and meet the needed Eligibility Index score (see page 47), you may be admitted any time after you have established an overall college grade-point average of 2.00 or better.

  If you have completed fewer than 12 quarter or semester units of transferable college credit since high school graduation, you must also satisfy the examination requirement for freshmen (see page 47).

- If you have graduated from high school and meet the needed Eligibility Index score but you have not completed one or more of the "A to F" subjects while in high school, you may be admitted after you have:

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

- If you did not meet the needed Eligibility Index score and lack the required subjects, you may be admitted after you have:

  1. established an overall grade-point average of 2.40 or better in another college or university;
  2. completed 84 transferable quarter (56 semester) units of credit in college courses; and
  3. completed one of the following:
     a. appropriate college courses, with a grade of C or better, in high school subjects that you lacked—up to two units (one unit = one year-long course) of credit may be waived except in English and mathematics;

     or

     b. one college course in mathematics; one in English; and one in either U.S. history, a laboratory science, or a foreign language, all with grades of C or better. The mathematics course must complete a sequence of courses at least as advanced as the equivalent of two years of high school algebra (elementary and intermediate) or one year of algebra (elementary) and one year of high school geometry. Courses other than mathematics must be transferable to the University.

"The atmosphere at Davis is generally friendly and not formal. People get along really well and the friends you make are close ones."

- Senior, Sociology/ Physical Geography

SPECIAL PROGRAMS AND ADMISSIONS CATEGORIES

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

The Educational Opportunity Program/Student Affirmative Action is designed to assist and provide opportunities in higher education for students from underrepresented ethnic groups and economically/educationally disadvantaged backgrounds.

An applicant may be admitted in one of two ways: (1) as a freshman or advanced standing student who has met the standard entrance requirements, or (2) as a special-action freshman or advanced standing student who has not met the entrance requirements but who has demonstrated academic potential.

Each EOP applicant must complete the regular UC admission forms and mark the appropriate places on the application related to EOP. In addition, the applicant is advised to take particular care to elaborate on personal circumstances in the required essay.

The $35 application fee is waived for qualified EOP applicants. If you are eligible for EOP sponsorship you will be notified at the time you receive your official letter of admission. If you are ineligible for EOP you will receive notification as soon as the determination has been made and will be required to submit the nonrefundable $35 fee in order to complete the processing of your application.

Financial aid is available to those individuals with a demonstrated financial need (see page 36). EOP/SAA also provides special assistance in areas pertinent to academic and student life (see page 27).

Academic Reentry Program

The Academic Reentry Program gives assistance in applying to the University to students in nontraditional age categories who are reentering the University after life and work experience. Preadmission and reentry advising provides assistance in combining past study with current academic and career goals. A reentry student who has not met the entrance requirements but has demonstrated recent academic potential, has special talents, or a disadvantaged educational history may be considered for admission by special action. (See page 28 for more information.)

Second Baccalaureate Status

If you have a bachelor's degree substantially equivalent to one that is granted by the University of California, you may be allowed to enroll as an undergraduate seeking a second bachelor's degree. Admission in this category will depend upon a superior academic record and clear evidence of a change in objective.

Admission to the College of Agricultural and Environmental Sciences and the College of Letters and Science requires the approval of the Admissions Officer and the Dean of the college. *(Enrollment pressures have necessitated closing this category of admission for the College of Engineering.)*

Limited Status

Students in limited status are those whose special attainments qualify them to take certain courses in the University toward a definite and limited objective. To apply for limited status admission you must either have a bachelor's degree but not be a candidate for an advanced degree, or have completed a substantial amount of college work with a satisfactory grade-point average. You will not be admitted to limited status for the purpose of raising a low scholarship average.

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

Admission to the College of Agricultural and Environmental Sciences and the College of Letters and Science requires the approval of the Admissions Officer and the Dean of the college. You must also submit transcripts from all schools attended. Fees and filing dates are the same as those for new applicants. *(Enrollment pressures have necessitated closing this category of admission for the College of Engineering.)*

Special Status

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

You will not be admitted to special status for the purpose of fulfilling requirements for admission as a regular student. Conditions for admission are determined by the Admissions Officer and are subject to the approval by the Dean of the college in which you plan to enroll. Admission is for a specified time only and a prescribed scholarship average must be maintained. Fees and filing dates are the same as those for new applicants. *(Enrollment pressures have necessitated closing this category of admission for the College of Engineering.)*

Nonresident Applicants

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

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

Intercampus Transfer Status

If you are currently registered as an undergraduate student or have been registered on another campus of the University of California, and have not subsequently registered at another institution, you may apply for an intercampus transfer to UC Davis. Intercampus transfer applications are available from and must be returned to the Registrar's Office on the UC campus you last attended. A nonrefundable filing fee of $35 must be submitted with your transfer application. Filing dates are the same as those listed for freshman applicants.

International Student Status

Applicants from other countries will be admitted in accordance with the general procedures governing nonresident admission. You may request an application by writing the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, California 95616. If you are not a United States citizen, immigrant, or refugee, you must return this application with your completed Financial Certification Form and the nonrefundable application fee of $35. Prior to admission, the Financial Certification Form is required to demonstrate the availability of $12,530 for the first year of study and adequate funding for the remaining years in the United States, until such time as the academic program is completed. Prior to registration, the signed Statement of Responsibilities for Privately Funded Student *or* the Statement of Responsibilities for Sponsored Student is required. It is very important to file your application during the appropriate filing period for the quarter for which you wish to attend (see page 43). Applications received after the first month of the filing period will be processed as space permits.

If your schooling has not been in English, or if English is not your native language, you are required to submit the results of the Test of English as a Foreign Language (TOEFL). Write to the Educational Testing Service, P.O.

Box 899, Princeton, New Jersey 08540, to arrange a testing date and location in your home country. The minimum TOEFL score which will be accepted is 500.

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

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

For additional information, see page 29.

Part-Time Status

If you are employed, retired, have family responsibilities, or health problems which preclude full-time study, you may qualify for enrollment in part-time status. Students may change status between full-time and part-time as their circumstances change. To be considered eligible, undergraduate students must be enrolled for ten units or fewer per quarter. Minimum progress requirements are waived for part-time students. A petition, available at dean's offices, must be approved by the Dean of your college (certain verifications are required), and then filed with the Registrar's Office no later than the tenth day of instruction in the quarter of enrollment. Part-time students have use of the same facilities and are eligible for the same services, including Student Health Services, as full-time students. For information on fee reductions applicable to part-time students, see ‡ footnote on page 35.

Employee-Student Status

Reduced fees are available to UC career employees and certain UC retirees who are qualified for admission to the University (see below for where to go for information regarding admission to the various schools and colleges). Once admission has been granted, a petition for the reduction in fees must be filed prior to each quarter of enrollment. Employee students pay ⅓ of the regular fees and may enroll for up to nine units or three courses per quarter whichever is greater. Detailed information is in the UC Staff Personnel Policy Manual (Section 260.23) for employees and 775.7 for retirees) available in department offices, at the Library Reference Center, or the Office of Labor Relations and Staff Development. Petitions can be obtained through the employee's unit.

Concurrent Enrollment Status

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

For information, write the University Extension Office, 414 Surge-IV, University of California, Davis 95616.

For admission to the Graduate Division, see page 95.

For admission to the Graduate School of Administration, see page 106.

For admission to the School of Law, see page 108.

For admission to the School of Medicine, see page 112.

For admission to the School of Veterinary Medicine, see page 116.

ADDITIONAL INFORMATION

Options for Nontraditional Students

While UCD graduate and undergraduate degree programs are designed primarily for students who can enroll full time on campus, the following programs make it possible for qualified nontraditional students to accumulate credit without enrolling full time:

For students admitted to UCD:
- Part-time status (see this page)
- Employee-student status (see this page)
- Credit by examination (see page 58)

For admitted and non-admitted UCD students:
- University Extension courses (see page 123)
- Summer Sessions courses (see page 122)

For students who have not been admitted to UCD:
- Concurrent courses (see page 123)

Preadmission advising is available to nontraditional students through the Academic Reentry Program (see page 50).

High School Proficiency Examination

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

Subject A Requirement

The University requires every undergraduate student to demonstrate college-level proficiency in English composition. This requirement is known as "Subject A." See page 61 for a full description of the means by which this requirement may be satisfied.

Advanced Placement Examinations

The Advanced Placement Examinations of the College Entrance Examination Board are taken in conjunction with courses taken in high school. You can receive 10 quarter units of University credit for each examination (except mathematics) in which you earn a score of 5, 4, or 3. These credits will apply toward the total required for graduation from the University. See the table on page 59 for course work equivalencies and limitations of credit.

Credit from Another College

The University gives unit credit to transfer students for courses they have taken at other accredited colleges and universities, including some extension courses. To be accepted for credit, the courses must be consistent with those at the University as determined by the Admissions Office. (Students accepted into the College of Agricultural and Environmental Sciences should refer to page 72 in regards to petitioning for upper-division courses evaluation.)

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

Applicants to the College of Agricultural and Environmental Sciences and to the College of Letters and Science who have more than 120 quarter (80 semester) units of credit for transfer must have the approval of the Dean of the College and satisfy University requirements for admission. (College of Engineering applicants should refer to page 74.)

REDIRECTION

If at the end of the first month of the application filing period (see page 43) there are more qualified applicants than a UC Davis college can accommodate within its enrollment quotas, all applications will be reviewed and some applicants may be redirected to another campus of the University.

ADMISSION CHECKLIST

☐ 1. Obtain the undergraduate admissions packet from your high school, a community college, or a campus of the University of California. If you are not a California resident, request an application from the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, CA 95616.

☐ 2. Complete the application, listing the college and major you prefer. Include your essay and a check or money order for $35 with your application forms and return them to the Undergraduate Admissions Office **during the first month of the filing period for the quarter in which you wish to enter.**

☐ 3. Request that transcripts, including work in progress, be sent from those schools attended. If test scores are required, please arrange to have these forwarded by the testing agency.

☐ 4. Retain for your records the notice received from the Undergraduate Admissions Office acknowledging receipt of your application.

☐ 5. Respond to Undergraduate Admissions Office requests for additional information, such as transcripts, test scores, or confirmation of work in progress. **Note: Your eligibility for admission cannot be evaluated until all your application materials are received,** i.e., application form, filing fee, essay, transcript, work in progress, and test scores (if required), so it is important to make these arrangements if you want to avoid delay in the processing of your application.

☐ 6. Retain for your records the notification of admission received with your "Statement of Intention to Register" form.

☐ 7. Return your "Statement of Intention to Register," with the nonrefundable advance deposit of $50 (if required), as soon as possible so your registration materials can be ordered before the day you register.

Academic Information

WHEN YOU ARRIVE

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

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

The Summer Advising and Registration Program 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 this conference program you will have a chance to become familiar with the campus, learn about the services available to students, such as financial aid and student advising, take required course placement exams and complete your registration and enrollment in classes. You will also be able to meet students, professors, and staff members and get some advice about majors, requirements, social life, and answers to questions you or your parents may have. It's a good way to start out, and Davis won't seem like such a strange new place in the fall.

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

REGISTRATION PROCEDURES

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

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

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

- Submit a Statement of Residence (see page 333).
- Return the completed Medical History form, evidence of rubella immunity, results of a tuberculin skin test, and the Insurance Information Request form. These forms are mailed to each new student from the Student Health Center.

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

Your registration will be complete when you have submitted your registration forms, paid your fees, and enrolled in classes. Late registration privileges extend through the tenth day of instruction, but you will be assessed a fee of $50 to defray the extra clerical costs of late registration. Permission to register after the tenth day of instruction will be allowed only under conditions where action or inaction on the part of the University delays registration. A recommendation from an appropriate administrative unit will be required.

If you have not satisfied the Subject A requirement, you must enroll in the English A course (see page 200). 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.

Study List Unit Limitations

Undergraduate students must carry a study load of at least 12 units each quarter in order to be certified as full-time students for social security, insurance, and financial aid purposes, or to compete in intercollegiate athletics. Graduate students must carry a study load of at least 4 units each quarter in order to be certified as full-time students.

Undergraduate students who qualify for part-time status (see page 51) enroll for ten units or fewer per quarter; and graduate students with part-time status enroll for one-half course load (see page 97). Employee-students (page 51) may enroll for up to nine units or three courses, whichever is greater, any given quarter.

Normally, an undergraduate student enrolls for about 15 units per quarter; however, you should familiarize yourself with the quarterly minimum-progress requirements on page 60. Undergraduate students should refer to College sections for quarterly maximum-unit allowances.

Students should also refer to the Advanced Placement chart on page 59 to eliminate the possibility of duplication in credit.

Adding or Dropping Courses

You are officially enrolled in all courses listed on your individual class schedule and will be held responsible for completing each of the courses. You must file a Drop-Add petition in order to add or drop courses after this initial enrollment. Petitions are to be filed with the office of the department offering a course to be added or dropped. See page 4 of this catalog for final dates for filing petitions each quarter, and refer to the appropriate *Class Schedule and Room Directory* for filing procedures. **After published deadlines** permission to change your study list may only be granted by the dean of your college or school and only in special circumstances. Graduate students must have their adviser's approval in order to drop courses. A course which is on your study list and for which you did no gradable work will be reflected on your official transcript. A verification of your study list is available some time after the fifth week of each quarter.

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's Office (Letters and Science

major change petitions are obtained from department offices).

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

Change of Name

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

Withdrawals

Withdrawals may be granted by the University for emergency reasons or for good cause. In order to withdraw approval must first be obtained from the dean of the student's college or school. Unauthorized withdrawals will jeopardize registration privileges and result in failing grades. Forms for requesting authorization for withdrawal are available at the Registrar's Office. Information on fee refunds is on page 36. (See below for a planned temporary leave.)

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

Readmission after an Absence

If you are a former UCD student planning to return to the University of California on the Davis campus, you must file an Application for Readmission with the Registrar along with the nontransferable, nonrefundable fee of $35. (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.

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

Quarter	Deadline Date
Fall 1984	August 17, 1984
Winter 1985	December 7, 1984
Spring 1985	March 8, 1985
Fall 1985	August 16, 1985

Graduate students applying for readmission should refer to page 96 of this catalog for filing deadlines.

Planned Educational Leave Program (PELP)

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

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

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

A fee of $35 is charged, payable when you enroll in the program. This fee is identical to that paid by a student who withdraws and is required to pay a readmission fee upon return.

The minimum Planned Educational Leave is one full quarter; the normal maximum is one full academic year. You may, however, request an extension of your leave. For purposes of this program, leave of one full quarter is defined as a leave beginning no later than the second week of instruction in a quarter. (See page 36 for fee refunds.)

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

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

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

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

"I was able to gain job experience in my field of interest through paid jobs and internships without ever leaving the campus. The practical experience gave me a head start on my post-graduation job search."

- Senior, Political Science

SCHOLASTIC REQUIREMENTS

The academic year consists of three ten-week quarters. Two six-week summer sessions are also offered. Stu-

dents normally attend the University three quarters per school year, but you may accelerate your progress by enrolling in one or both summer sessions (see page 18).

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

GRADING

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

A, *excellent*
B, *good*
C, *fair*
D, *barely passing*
F, *not passing (work so poor that it must be repeated to receive recognition)*
I, *incomplete (work is satisfactory but incomplete for a good cause)*
IP, *in progress*
P, *passed (grade C– or better)*
NP, *not passed*
S, *satisfactory*
U, *unsatisfactory*

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

Grade Points

Grade points are assigned each letter grade as follows:

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

Grade-Point Average (GPA)

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

A student at Davis is expected to maintain a C (2.0 GPA) or better in all work undertaken in the University. If you fall below a C average, you are considered "scholastically deficient" (see page 58).

Passed/Not Passed (P/NP) Grading Option

Subject to regulation by the faculties of the various colleges and schools, an undergraduate student in good standing can petition to take specific courses on a Passed/Not Passed basis. Petitions are available in deans' offices as of dates published in the *Class Schedule and Room Directory* and must be filed before the end of the fifth week of instruction.

The grade P is assigned for a grade of C– or better. Units thus earned are counted in satisfaction of degree requirements but are disregarded in determining your grade-point average.

The intent of this option is to encourage exploration in areas in which you have little or no previous experience by alleviating grading pressures. **The maximum number of units graded P that will be accepted for degree credit is ⅓ of the units completed in residence on the Davis campus.** Consequently, at least ⅔ of the units completed in residence at Davis and presented in satisfaction of degree requirements must be in courses taken for a letter grade. Your quarterly transcript will show the total number of units graded P you have accumulated, as well as the number of units graded P that are in courses taken on a P/NP basis at your option. If you are planning to take courses on a P/NP basis, you should also familiarize yourself with the requirements of your particular school or college which may have introduced conditions or restrictions in addition to the University requirements.

If you elect the P/NP grading option for courses graded upon completion of a two- or three-quarter sequence (In-Progress grading), a petition submitted by the end of the fifth week of the first term applies to all terms of the course. A petition submitted during the second term but before the end of the fifth week of the second term applies to the second and any remaining terms of the course.

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

Satisfactory/Unsatisfactory (S/U)

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

Petitions are available from the Graduate Division and must be signed by your graduate adviser. (See page 121 for Individual Study courses.) Courses in which a C, D, or F grade is received may *not* be repeated with the S/U option.

Passed/Not Passed (P/NP) Grading Only

In specific courses which have been approved by the respective departments and by the appropriate Committees on Courses of Instruction, individual instructors will assign *only* Passed or Not Passed grades. (See pages 120-21 for Special Study courses.)

In-Progress (IP) Grading

For a course extending over more than one quarter (designated "deferred grading only, pending completion of sequence" in course descriptions), evaluation of student performance is deferred until the end of the final quarter. Provisional grades of IP are assigned in the intervening quarters and are replaced with the final grade at the completion of the sequence. In order to gain credit toward graduation, a student must successfully complete the entire sequence in successive quarters.

Incomplete Grades

The grade of I may be assigned when a student's work is of passing quality and represents a significant portion of the requirements for a final grade, but is incomplete for a good cause as determined by the instructor. (Good cause may include illness, serious personal problems, an accident, a death in the immediate family, a large and necessary increase in working hours, or other situation of equal gravity.) You may replace an I grade with a passing grade and receive unit credit (and grade points if the instructor assigns a letter grade) provided you satisfactorily complete the course work as specified by the instructor. In order to change your records, you must obtain a petition from the Registrar's Office and present it to your instructor for completion and mailing. *An I grade must be replaced with a letter grade (or P or S grade) before the end of the third succeeding term of the student's academic residence, or the grade will revert to an F (or NP or U). If a student's degree is conferred before the expiration of the time limit for an I-grade conversion, and the grade is not replaced by the end of the third term succeeding the term in which the I grade was assigned, the I grade will remain on the student's record.*

You may not re-enroll for credit in couses for which an I grade has been assigned. An undergraduate student whose record shows more than 16 units of I grades will be subject to disqualification (see page 60). A graduate student who accumulates more than eight units of I grades will be subject to probation.

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

Changes of Grade

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

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

Repetition of Courses

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

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

Mid-Term Grade Standing

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

Final Grades

Grades are generally available about three weeks after a quarter has ended. If you wish to have your grades mailed to you, deposit a stamped, self-addressed envelope with the Registrar's Office before the end of the term.

Transcripts

A record of each student's academic work at UCD is prepared and retained permanently by the Registrar's Office. Copies of your official transcript may be obtained from the Registrar's Office for $3 for the first copy and $1 each for additional copies requested at the same time. Transcripts of all work done through University Extension or Concurrent Enrollment should be requested directly from the University Extension Office, 414 Surge-IV. Transcripts of work completed at another campus of the University or at another institution must be requested directly from the campus or institution concerned.

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

CLASS LEVEL

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

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

EXAMINATIONS

Final Examinations

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

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

At the instructor's option, the final examination may be completely or in part a take-home examination. The writing time (in undergraduate courses) of a take-home and an in-class final examination together should not exceed three hours. In each course in which a final examination is required, the students have the right to take the final examination (and/or submit the take-home examination) at the time published in the *Class Schedule and Room Directory*. The scheduling of an examination at a time other than the specified time requires the mutual consent of the instructor and each student enrolled in the course. Any student who does not consent in writing to a different time must be permitted to take an examination (or submit the instructor-opted take-home examination) at the officially scheduled time. A student who consents in writing to a change in the final examination time waives the right to take the examination as originally scheduled. Departures from the published examination schedule should be carried out so as not to disadvantage students who are unable to accept the alternate schedule. A student who is improperly denied the right to take a required final examination on the published date (or submit the take-home examination as opted by the instructor) may file a petition with the Executive Council of the Davis Division of the Academic Senate by the end of the next regular term for appropriate action.

An instructor may release each student's original examination, or a copy, at any time, or the instructor may opt to retain final examination materials, or copies thereof, until the end of the next regular term, during which period students may have access to their examinations.

Midterms

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

Credit by Examination

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

The completed petition, accompanied by a fee of $5, must be presented for final approval to the dean of your college or school, or if you are a graduate student, to the Dean of the Graduate Division.

The credit received for the examination may not duplicate any credit you have already applied toward your degree. The final results will be reported to the Registrar who will assign you the appropriate grade and grade points. Since failure to pass the examination will be recorded as an F, you are encouraged to prepare fully for such an examination before attempting it.

Learning in nonacademic settings can also be validated through credit by examination.

SCHOLARSHIP DEFICIENCIES

The following provisions apply to all undergraduate students in the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science. Graduate and professional students with scholarship deficiencies are subject to action at the discretion of their respective deans.

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

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

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

College Entrance Examination Board (CEEB) Advanced Placement Examination Credit

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

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

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

EXAMINATION	SCORE	UCD COURSE EQUIVALENCIES	CONTINUING COURSE	CREDIT TOWARD DEGREE	CREDIT ALLOWED TOWARD SPECIFIC DEGREE REQUIREMENTS
ENGLISH					**English/Humanities Credit**
English	5, 4	English A, 1, 3		10 units	College of Agricultural & Environmental Sciences: 4 units Satisfies Subject A requirement, and 4 units toward College English/Rhetoric requirement. College of Engineering: 10 units Satisfies English 1, 4 units of Humanities & Social Sciences electives, and 2 units of Unrestricted electives. College of Letters & Science: 4 units Humanities & Fine Arts credit. Satisfies Subject A requirement, and first couse toward English Composition requirement.
	3	English A		10 units	College of Agricultural & Environmental Sciences: 0 units Satisfies Subject A requirement. College of Engineering: Satisfies Subject A requirement, and Unrestricted electives. College of Letters & Science: 0 units No Humanities & Fine Arts credit. Satisfies Subject A requirement.
FOREIGN LANGUAGES					**Humanities Credit/Unrestricted Electives**
French	5, 4, 3	French 6	French 30A or any upper-division literature course.	10 units	4 units For each foreign language examination passed.
German	5, 4, 3	German 4, 6A or 6B	Any upper-division course; German 101 strongly recommended.	10 units	In the College of Letters & Science these examinations also satisfy the Foreign Language requirement.
Latin (Vergil)	5, 4, 3	Latin 103	Determined by consultation with Classics adviser.	5 units	
(Lyric)	5, 4, 3	Latin 105	Determined by consultation with Classics adviser.	5 units	
Spanish	5, 4, 3	Spanish 5	Spanish 28.	10 units	
HUMANITIES					**Humanities Credit/Unrestricted Electives**
Art Studio	5	Art 2, 5	Art 3.	10 units	8 units
	4	Art 2	Art 3 or 4.	10 units	4 units
Art History	5, 4	Art 1A, 1B, 1C		10 units	10 units
	3	Art 10HA		10 units	4 units
American History	5, 4, 3	History 17A, 17B		10 units	8 units Satisfies American History & Institutions requirement.
European History	5, 4, 3	History 4B, 4C		10 units	8 units
Music	5, 4, 3	Music 10 units		10 units	4 units
NATURAL SCIENCES					**Natural Sciences Credit/Preparatory Courses for Science Majors**
Biology	5, 4	Biological Sciences 1 and Botany 2 or Zoology 2-2L	Any appropriate upper-division course in the biological sciences. Bacteriology 2, Botany 2 or Zoology 2-2L.	10 units	10 units Student has option of taking Botany 2 or Zoology 2-2L for full credit. In the College of Engineering, 5 units apply toward the "Basic Science and Mathematics" or "Technical electives."
	3	Biological Sciences 1	Bacteriology 2, Botany 2 or Zoology 2.	10 units	
Chemistry	5, 4, 3	Chemistry 1A, 1B		10 units	10 units Credit for Chemistry 1A and 1B equivalence may serve as prerequisite to 1C with the instructor's consent. While 1A and/or 1B may be taken for full credit, the 4A-4B-4C sequence is preferred.
Mathematics AB	5, 4, 3	Mathematics 11, 21A	Mathematics 21B.	5 units	4 units Students who achieve a score of 5 or 4 may, with the instructor's consent, enroll in Mathematics 21C.
BC	5, 4, 3	Mathematics 11, 21A, 21B	Mathematics 21C.	10 units	8 units
Physics B	5	Physics 1A, 1B, 2A, 2B, 2C, 10	Determined by consultation with adviser.	10 units	10 units No credit for laboratory parts of Physics 4 or 3.
B	4, 3	Physics 10		10 units	10 units Course equivalents may be used as prerequisites for succeeding courses of same series by consent of the instructor. Any equivalent course may be taken for full credit with consent of the instructor and curriculum committee, but probably disallowed if a high score is achieved on the examination.
CI	5	Physics 1A, 2A or 8A		10 units	4 units
CI	4	Physics 1A or 2A		10 units	4 units
CII	5	Physics 1B, 2B, or 8B		10 units	4 units
CII	4	Physics 1B or 2B		10 units	4 units **Note:** In the College of Engineering only a score of 5 on the CEEB (CI and CII) Examinations applies toward physics requirement.

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

- the student's grade-point average (GPA) is less than 1.5 for the term
- the student has attempted more than 16 units graded "I" (Incomplete)
- the student has spent two consecutive terms on academic probation without achieving a cumulative grade-point average of 2.0.

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

"Below minimum progress subject to disqualification. Continued registration will be at the discretion of the dean of your college, and any questions should be directed to the dean," will be noted on the transcript the first time the total number of units passed at UCD **averages less than 12,** calculated at the end of every term for the preceding three terms of enrollment.

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

It is assumed that a student will earn 180 units and obtain a degree prior to completing fifteen terms of enrollment.

The following courses may be counted toward unit minimums:

- Required non-credit courses, e.g., Mathematics B, will be evaluated according to the "Carnegie unit" rule and counted as units passed (see page 120)
- Repeated courses passed to improve D or F grades
- Courses passed during Summer Session at UCD or at another accredited school and transferred to UCD will be counted as units passed (applied to term of enrollment just preceding the summer session)
- Courses passed by examination in accordance with policies established by the Divisional Committee on Courses (applied to term in which examination is taken)
- Courses that are IP (in progress) will be counted as units passed
- Courses graded I will be counted as units passed when replaced by a passing grade (applied to the term in which the I grade is received).

The faculty of a college may grant a student a minimum progress variance of one or more quarters for an acceptable reason. Advising assistance should be obtained either through the student's faculty adviser or in the college Dean's Office.

Credit from Other Institutions

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

Transfer with Scholastic Deficiencies

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

STUDENT RESPONSIBILITY

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

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

Student Conduct and Discipline

Students enrolling or seeking enrollment in the University assume an obligation to act in a manner compatible with the University's function as an educational institution. Rules concerning student conduct, student organizations, use of University facilities, and related matters are set forth in both University policies and campus regulations. A standard for student conduct is outlined in the booklet *University of California Policies Applying to Campus Activities, Organizations, and Students.* The operation of the campus student disciplinary system is outlined in the booklet *UCD Administration of Student Discipline.* These policies and regulations are available from the Office of the Vice Chancellor—Student Affairs, 541 Mrak Hall, and the Coordinator of Student Judicial Affairs, 466 Memorial Union.

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

Alleged violations of campus or University standards will be investigated by the coordinator of Student Judicial Affairs. If complaints cannot be resolved informally be-

tween the coordinator, the accused student, and the referring party, the case may be referred to a hearing before the Student Conduct Committee, Campus Judicial Board, a hearing officer, or another appropriate officer. The President of the University, through the Chancellor, has ultimate authority for the administration of student discipline.

BACHELOR'S DEGREE REQUIREMENTS

Four 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. Davis campus requirement, which applies to all colleges;
3. College or school requirements; and
4. Individual major requirements.

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

UNIVERSITY REQUIREMENTS

Subject A: English Requirement

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

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

- By achieving a score of 600 or higher on the College Entrance Examination Board (CEEB) Achievement Test in English Composition.
- By achieving a grade of 5, 4, or 3 in the CEEB Advanced Placement Examination in English.
- By entering the University with credentials showing the completion of an acceptable 3-semester or 4-quarter unit college-level course in English composition with a grade of C or better.
- By passing *with credit* the California State University and Colleges English Equivalency Examination. (Note: the CSUC English Placement Test *may not* be used to satisfy the Subject A requirement.)
- By writing a passing essay on the Subject A Diagnostic Examination. This examination may be taken only once. It is offered during the Summer Advising sessions and the Orientation period at the beginning of each quarter. Consult the "Schedule for Registration and Orientation" published prior to the beginning of each quarter for time and location of the Orientation Week examination.

If you have not satisfied the requirement in one of the ways described above, *you must enroll in English A during your first quarter of residence at the University, or as soon thereafter as space is available in the course.* The English A course must be taken for a letter grade and passed with a grade of C or higher. Students receiving a grade of C- or lower must repeat the course. This course counts as 4 units on your study load and toward minimum progress.)

International students whose native and school language is not English, and some students whose schooling combines work in the United States and in another country, must demonstrate proficiency in English. The level of proficiency must meet the standards of both the English for International Students program and the Subject A program. The results of a special examination in English composition determine whether a student has met the Subject A requirement or must take specific course work before meeting that requirement.

American History and Institutions

The American History and Institutions requirement ensures that every graduating student will have at least a minimum knowledge of the background of this country's development and an understanding of the political, economic, and social interrelationships of its way of life.

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

- By offering one high school unit in American history, or ½ high school unit in American history and ½ high school unit in civics or American government, with a grade of C or better in each course.
- By completing any one of the following courses:
  Afro-American Studies 10, 100, 120, 121
  Asian American Studies 1, 2
  Economics 111A, 111B
  History 17A, 17B, 27A, 27B, 72A, 72B, 170A, 170B, 170C, 171A, 171B, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 177, 179, 180A, 180B, 183A, 183B (upper-division courses may be taken only with the consent of the instructor)
  Native American Studies 10, 55, 116, 130A, 130B, 130C
  Political Science 1, 5, 5D, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 130, 131, 160, 163

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

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

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

"UCD offers a wide variety of majors. As a freshman I was uncertain about what I wanted to do, so I chose a campus that offered me opportunities to explore different kinds of majors."

- Senior, Ag & Managerial Economics

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

Residence Requirements

The minimum residence requirement for a bachelor's degree at the University of California is one academic year (three quarters). Each summer session in which a student completes a course of at least 2 quarter units may be counted as half a quarter's residence. Thirty-five of the final 45 quarter units completed by each candidate must be earned while in residence on the Davis campus. Not more than 18 of these 35 quarter units may be completed in summer session courses at UCD.

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

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

"General education should enhance the student's ability to think critically and to understand the ways in which scholars in various fields undertake inquiry."

- Professor, Sociology

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 the candidate plans to receive the degree. The dates for filing are published in the calendar on page 4.

DAVIS CAMPUS REQUIREMENT

General Education Requirement

The General Education Program on the Davis campus seeks to promote intellectual growth among all students in the undergraduate colleges. To achieve this goal, the program requires of all students an understanding of the methods as well as the content of important areas of knowledge.

The program's objectives are: (1) to offer undergraduates a coherent choice of courses in all major fields of learning; (2) to stimulate intellectual growth through the study of important methods as well as significant material in a particular discipline; (3) to involve students in the learning process by requiring considerable writing and serious participation in class activities; and (4) to encourage students to apply the concepts and methods of a discipline in appropriate advanced-level courses. Complementing specialized training in a major, the program provides students with the more general intellectual tools of critical thinking, scientific method, and skills in research.

General Education courses are designated as either "introductory" or "non-introductory", and are grouped in three broad areas of knowledge:

1. **Civilization and Culture.** Courses in this area are designed to foster knowledge of the dominant intellectual traditions, achievements, and socio-political institutions of Western civilizations. These courses should stimulate awareness of cultural diversity within the Western tradition and in other civilizations, and provide comparative and interdisciplinary perspectives on cultural history.
2. **Contemporary Societies.** Courses in this area are designed to create an awareness of critical economic, political, and social problems of the contemporary world. Courses in this area will also help students learn to study contemporary societies and social problems using the disciplines of modern social and behavioral science, and to appreciate the variety of values and perspectives that are embodied in the experience of diverse human groups.
3. **Nature and Environment.** Courses in this area are aimed at providing students with knowledge of major scientific ideas and discoveries and some perception of the methods, scope, power, limitations, and appeal of science. Students should be able to gain awareness of both the kinship of, and the distinction between, science and technology. It is a major goal of the General Education Program that even students not primarily interested in scientific disciplines should be able to read and understand scientific literature addressed to the educated public.

Study in a major program usually is contained within one of these three areas. The area to which a specific major is assigned may be ascertained by consulting the appropriate sections of this catalog for the Colleges of Agricultural and Environmental Sciences (p. 68), Engineering (p. 76), and Letters and Science (p. 85). The General Education Program requires students to complete a certain number of courses in each of the two areas *outside* the area which contains their major field.

There is a four year phase-in period for the General Education Program beginning with Fall Quarter 1984. Students who have entered UCD prior to Fall Quarter 1984 are not required to fulfill the campus General Education requirement. For students entering in the

Fall Quarter 1984 and thereafter, the specific General Education requirements which must be satisfied depend upon the year of entrance and the number of approved transfer units, if any. These specific requirements are detailed below:

If you are a *freshman* or a *transfer student with fewer than 41 transfer units and*

- you enter during the 1984–85 academic year, you are required to complete two General Education courses outside the area of your major.
- you enter during the 1985–86 academic year, you are required to complete four General Education courses outside the area of your major. Not more than three of the four courses may be in a single area of General Education, and not more than two of the four courses may be introductory General Education courses.
- you enter during the 1986–87 academic year, you are required to complete the *full requirement* of three General Education courses in each of the two areas outside the area of your major.

If you are a *transfer student with 41 or more, but fewer than 84, transfer units and*

- you enter during the 1984–85 academic year, you are *not* required to fulfill the General Education Requirement.
- you enter during the 1985–86 academic year, you are required to complete two General Education courses outside the area of your major.
- you enter during the 1986–87 academic year and thereafter, you are required to complete either two General Education courses in each of the two areas outside your major or three General Education courses in one of the required areas and one course in the other required areas.

If you are a *transfer student with 84 or more transfer units and*

- you enter during the 1984–85 or 1985–86 academic years, you are *not* required to fulfill the General Education requirement.
- you enter during the 1986–87 academic year, you are required to complete two General Education courses outside the area of your major.
- you enter during the 1987–88 academic year and thereafter, you are required to complete either one non-introductory General Education course in each of the two areas outside the area of your major or three General Education courses in one of the two areas.

For further information concerning the approved General Education courses and other details concerning the specific regulations of the Program, consult the *General Education Announcement.*

HONORS AND PRIZES

Deans' Honors List

According to Davis campus regulations, the quarterly Dean's Honors List is comprised of names of students who have completed, for a letter grade, a minimum of 12 units in a specific term with a grade-point average equal to or higher than the minimum grade-point average attained by the upper 16 percent of those registered in the same class-level and college during the preceding term. Any additional regulations set by a particular college will be stated within that section of this catalog. Honors Lists will be posted quarterly on bulletin boards outside Dean's Offices, and a notation of these honors will be placed on each student's permanent record by the Registrar's Office.

Scholarships

Students with outstanding academic records and who show promise of continued scholarly achievement are encouraged to apply for scholarship recognition and awards. Awards are accompanied by a financial honorarium or stipend (see page 39).

Graduation Honors

Honors at graduation will be awarded to students who have completed units of credit in the University with a grade-point average which places them in the corresponding *top percent* of the graduating class of their college or school as shown in the following table:

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

The grade-point averages which mark the cut-off points for each honors category for the June graduating class (namely, winter term grades for candidates for June of each year) will be used as minimum criteria for the award of the same category of honors to students who graduate in the terms immediately following. Grade-point averages for the cut-off points (in the table above) for Winter Quarter 1984 are shown below. These averages will be used through Winter 1985.

	Grade-Point Average by College		
Percent Determining Cut-Off Point	Agricultural and Environmental Sciences	Engineering	Letters and Science
2%	3.818	3.890	3.866
3%	3.775	3.797	3.804
4%	3.718	3.786	3.767
6%	3.635	3.736	3.724
8%	3.589	3.692	3.670
12%	3.488	3.586	3.571
16%	3.402	3.527	3.480

All students having the same grade-point average as the one that falls at each percent cut-off point will be awarded honors in that category. Students should refer to specific college sections of this catalog for any additional requirements.

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

Prizes

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

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

"The general education program seeks to encourage students to be active citizens who keep up a vigorous intellectual life after leaving the University."

- Professor, Physics

Honorary Societies

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

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

"The courses are difficult, but when you really try your best, when you can honestly say to yourself, 'I'm doing my very best,' it's rewarding and satisfying. There are no free A's and B's, you really do have to work for your grades, so when you receive a good grade you can say, 'I earned it.'"

- Senior, Spanish

College of Agricultural and Environmental Sciences

College of Agricultural and Environmental Sciences

Information:
College Office
228 Mrak Hall
752-0107

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

Teaching and research in the College now extend far beyond the traditionally important mission of food and fiber production. Activities range from the soil to the home, from the farms to the cities. The best uses of land and forest areas, as well as the management of water for home, agriculture, wildlife, recreation, and industry are studied. These areas, reflected in the 41 majors and three programs in the College, offer interesting and practical career opportunities.

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

ADMINISTRATIVE STRUCTURE

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

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

STUDENT RESPONSIBILITY

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

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

PROGRAM PLANNING

Your Role

Although many services are provided to assist in program planning, in the last analysis you are the one who determines which program to pursue. The most crucial decision you make in this process is selecting your educational objectives. These may or may not require enrollment in a university. As part of making this decision, you should investigate the educational opportunities in the College by visiting the campus before applying for admission and talking with the deans, faculty members, and students. If the University is to be a means of reaching a career decision, you should examine its potential for meeting your goals.

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

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

The concept of prerequisite knowledge is particularly misunderstood. Education is a building process. It is difficult or impossible to learn advanced principles without first understanding elementary ones. As a matter of convenience, most students acquire preparatory knowledge through prerequisite courses, but that is not the only route available. If you have acquired the prerequisite knowledge by other means, you need not take the specified prerequisite. Instructors will often indicate on the basis of informal discussions that you are prepared for advanced study without the need for courses. Courses may also be challenged by examination (see page 58).

Flexibility in planning has also been constrained by the belief that students in one college may not take

courses in other colleges. This is *not* true. Within the boundaries of enrollment limitations and Academic Senate policy—and your ability to acquire useful knowledge as a result of taking a particular course—you may enroll in almost any course listed in this catalog.

College Services

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

Faculty Advisers

You will be assigned a faculty adviser to help you plan a program that corresponds to your individual educational interests. The assignments are made by Master Advisers, each of whom is responsible for coordinating advising within a major. If you have not decided on a specific major, you will be assigned to the Exploratory Program. In this case, you will have a faculty 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 a faculty adviser with the training and experience required to facilitate your program planning.

The function of faculty advisers is to sensitize students to the educational opportunities at Davis, to discuss the implications of one option or another, and generally, on the basis of experience, to help students achieve their educational goals. The great potential which a faculty adviser-student relationship can have has long been recognized within the College, and you are strongly urged to consult with your faculty 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 faculty adviser whose area of expertise corresponds more directly to your specific objectives.

Advising Centers

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

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

Peer Advisers

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

Associate Deans of Resident Instruction

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

Orientation Class

Each quarter the College offers an orientation class (see page 277) 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

You may find that, because of space limitations, the descriptions in the *Catalog* will not include all the information you would like about a course. The faculty of the College has responded to this need by writing the "Expanded Course Descriptions" giving more detailed explanations about each of its course offerings. These descriptions are available each quarter to assist students in selecting their courses. They contain such information as course goals, texts used, preparation required of students, bases for grading, course format, special assignments (papers, field trips, etc.), and a topical outline of the material to be covered.

Copies of the "Expanded Course Descriptions" are available for on-campus use at the Shields Library Reference and Periodicals desks, the College Dean's Office, advisers' offices, advising centers, departmental offices, The First Resort, and in the dormitories at the head residents' offices.

Work-Learn Opportunities

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

Some work experiences are introductory in nature and demand a limited time commitment and have no academic credit involved. Others require more intensive involvement of an academic nature and may offer credit. Students who wish to secure credit for an internship may arrange for enrollment in a 92 or 192 course through the appropriate department and Work-Learn and Career Planning and Placement Office. Students must complete

"The education a student receives here is exceptional. Many faculty members are leading authorities in their fields."

- Senior, Ag and Managerial Economics

at least 84 units in order to enroll in a 192 course. (See page 121 for details.) A maximum of 12 units of internship courses and a total of 20 units of variable-unit courses (see College requirement on page 71) may be counted toward the 180 units required for graduation.

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 Programs and Courses section of this catalog.

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

Each major is assigned to one of the three General Education categories (see page 62): Contemporary Societies (CS), Nature and Environment (NE), and Civilization and Culture (CC). The appropriate category is indicated immediately following the major.

ANIMAL SCIENCE
J. Warren Evans, Ph.D., Associate Dean
College Office, 228 Mrak Hall, 752-6970

Majors in Animal Science
Animal Science (NE)
Avian Sciences (NE)
Wildlife and Fisheries Biology (NE)

Advising Centers:
177 Hart Hall, 752-6118 (Animal Science only)
215 Asmundson Hall, 752-3535 (Avian Sciences only)
66 Briggs Hall, 752-6586 (Wildlife and Fisheries Biology only)

Interdisciplinary Major
Agricultural Science and Management (NE)

Advising Center:
177 Hart Hall, 752-6118

APPLIED ECONOMIC AND BEHAVIORAL SCIENCES
Hoy F. Carman, Ph.D., Associate Dean
College Office, 228 Mrak Hall, 752-6360

Majors in Applied Economics
Agricultural and Managerial Economics (CS)
Development, Resource and Consumer Economics (CS)

Advising Center:
105 Voorhies Hall, 752-6185

Majors and Programs in Behavioral Sciences
Agricultural Education (CS)
Applied Behavioral Sciences (CS)
Asian American Studies (non-degree program) (CS)
Design (CC)
Human Development (CS)
Landscape Architecture (CC)
Native American Studies (CS)

Advising Centers:
101 or 103 Academic Office Building-4, 752-2244
152 Walker Hall, 752-1165 (Design; Landscape Architecture only)

BIOLOGICAL SCIENCES (an Intercollege Division)
Donald L. McLean, Ph.D., Divisional Dean
Division Office, 171 Mrak Hall, 752-0410

Majors in Biological Sciences
Bacteriology (NE)
Biochemistry (NE)
Biological Sciences (NE)
Botany (NE)
Genetics (NE)
Physiology (NE)
Zoology (NE)

Advising Centers:
171 Mrak Hall, 752-0410
196 Briggs Hall, 752-0203 (Animal Physiology only)
151 Robbins Hall, 752-0617 (Botany only)
2320 Storer Hall, 752-7468 (Zoology only)

ENVIRONMENTAL STUDIES (an Intercollege Division)
Paul A. Sabatier, Ph.D., Acting Associate Dean
2132 Wickson Hall, 752-3026

Majors in Environmental Studies
Environmental Planning and Management (CS)
Environmental Policy Analysis and Planning (CS)

Advising Center:
2134 Wickson Hall, 752-3088

FOOD, NUTRITION, TEXTILE AND CONSUMER SCIENCES
Michael J. Lewis, Ph.D., Associate Dean
College Office, 228 Mrak Hall, 752-6971

Majors in Food Sciences
Fermentation Science (NE)
Food Biochemistry (NE)
Food Science (NE)

Advising Centers:
128 Cruess Hall, 752-1468 (Food Science only)
3469 Chemistry Annex, 752-2159 (Food Biochemistry only)
3013 Wickson Hall, 752-0387 (Fermentation Science only)

Majors in Nutrition
Community Nutrition (NE)
Dietetics (NE)
Nutrition Science (NE)

Advising Center:
109 Everson Hall, 752-2512

Majors in Consumer Sciences
Consumer Food Science (NE)
Home Economics (CS)
Textiles and Clothing (CS)
Textile Science (NE)

Advising Centers:
128 Cruess Hall, 752,1468 (Consumer Food Science only)
109 Everson Hall, 752-2512

Exploratory Program

Exploratory (non-degree program)

College Academic Advising Center:
122 Hoagland Hall. 752-0610

INDIVIDUAL MAJOR

College Academic Advising Center
122 Hoagland Hall, 752-0610

PLANT SCIENCES AND PEST AND DISEASE MANAGEMENT

Calvin O. Qualset, Ph.D., Associate Dean
College Office, 228 Mrak Hall, 752-0819

Majors and Programs in Plant Sciences

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

Advising Centers:
258 Hunt Hall. 752-1715
122 Hoagland Hall (Preforestry only). 752-1669

Major in Pest and Disease Management

Entomology (NE)

Advising Center:
265B Briggs Hall. 752-0489

Interdisciplinary Major

Agrarian Studies (CS)

Advising Center:
2039 Wickson Hall. 752-0926

RESOURCE SCIENCES AND ENGINEERING

Dennis E. Rolston, Ph.D., Associate Dean
College Office, 228 Mrak Hall, 752-0110

Majors in Resource Sciences

Atmospheric Science (NE)
Environmental Toxicology (NE)
Resource Sciences (NE)
Soil and Water Science (NE)

Advising Centers.
122 Hoagland Hall. 752-1669
109 Environmental Toxicology Building. 752-1142
(Environmental Toxicology only)

Major in Agricultural Engineering

(See College of Engineering, page 180)

Interdisciplinary Major

International Agricultural Development (CS)

Advising Center:
139 Academic Office Building. 752-1804

Exploratory Program

Are you unsure what major you really want to pursue? If so, you may wish to register in the Exploratory Program. With the assistance provided by the College's Academic Advising Center and the major advisers in the respective departments and major program offices. you will be able to explore specialization options. develop your decision-making processes. and ultimately select the major best suited to your needs. A major must be declared before 120 units (see Declaration of Major below).

For registration purposes. indicate "Exploratory" on your admissions materials. Futher information is available from the Academic Advising Center, 122 Hoagland Hall, 752-0610.

Individually Designed Major Programs

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

Additional information may be obtained by contacting the College's Academic Advising Center, 122 Hoagland Hall, 752-0610. (Also see page 234.)

Preprofessional Programs

The preprofessional program in forestry is a two-year plan which prepares students for entering a degree program in forestry or conservation. Davis does not offer a bachelor's degree in forestry; however, advisers in the College can help you prepare a lower-division program that will provide a basis for continuing work at another school. (Also see page 101.)

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

Declaration of Major

Students who have not declared a major must do so by the time 120 units have been acquired. Failure to declare a major at this point will result in a hold on your further registration. In order to declare a major, you must meet with your faculty adviser, fill out a Change of Major petition obtainable at the Registrar's or Dean's Offices. and file the petition with the Dean's Office. If you have completed 120 units you must arrange at the same time a Study Plan with your adviser (see page 71). You are accepted into a major only after both your adviser and the Dean have approved the Change of Major petition.

Change of Major

Within the College. You may change from one major to another within the College by obtaining approval from a faculty adviser of the new major you have selected and the Dean. Admission into a major program may be denied or deferred if your grade-point average in courses that are required for the selected major or your

overall grade-point average is below 2.000. Procedures for changing a major within the College are the same as those for declaring a major (see above), and the same conditions apply.

Accompanied by Change of College. Petitions for a change of major involving change of college should be filed within the first five weeks of the quarter. A change petition, available at the Dean's Office, must be endorsed by a faculty adviser of the new major you are selecting and signed by the Dean of the college from which you wish to transfer. In addition, admission to the new college will require that Dean's approval. Permission to transfer from one college to another may be denied or deferred if you are in academic difficulty or have less than 2.000 in courses that are required by the new major.

Multiple Majors

Because of similarity in course requirements for many of the major programs, requests for multiple majors within the College are not normally approved. If you are interested in two or more areas of study, you should consider the options of planning an individually designed major (page 69), or of adopting one or more of the minor programs (below) offered by the College to complement your major. You may also request that your transcript note that you have completed all the requirements for study of a major in addition to your selected major.

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

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 98.

Grade-Point Average in the Major

Beginning Fall Quarter 1984, students entering the College will be required to attain a minimum grade-point average of 2.000 (College Regulation 52-A) in the major for the awarding of the Bachelor's Degree. Each candidate must complete a program of study either as prescribed in (a) a major approved by the Committee on Majors and Courses of Instruction and printed in this Catalog; or (b) an Individual major approved by the Individual Major Committee. The major program must include a specification of Depth Subject Matter in which the degree student will be required to attain an average grade point of at least 2.000.

MINOR PROGRAMS

Departments in the College of Agricultural and Environmental Sciences and in the College of Letters and Science may offer optional minor programs. Completion of a minor is not required for graduation. However, when your total educational objectives cannot be met through a major alone, you may wish to complete the requirements for one or more minor programs and have this certified on your records.

Following is a list of approved minor programs within the College. Requirements for each program can be found under the department offering the minor (in parentheses). See page 87 for minors approved by the College of Letters and Science.

- Aging and Adult Development (Applied Behavioral Sciences)
- Agricultural Entomology (Entomology)
- Apiculture (Entomology)
- Asian American Studies (Applied Behavioral Sciences)
- Biological Sciences (Biological Sciences)
- Community Development (Applied Behavioral Sciences)
- Community Nutrition (Nutrition)
- Energy Policy (Environmental Studies)
- Entomology (Entomology)
- Environmental Policy Analysis (Environmental Studies)
- Environmental Toxicology (Environmental Toxicology)
- Food Service Management (Nutrition)
- Insect Ecology (Entomology)
- Insect Systematics (Entomology)
- Medical-Veterinary Entomology (Entomology)
- Native American Studies (Applied Behavioral Sciences)
- Nematology (Entomology)
- Nutrition and Food (Nutrition)
- Nutrition Science (Nutrition)
- Textiles and Clothing (Textiles and Clothing)
- Textiles Science (Textiles and Clothing)

A minor normally consists of a minimum of 18 units of upper-division course work. In some cases one lower-division course may be substituted to meet minimum requirements. Only one course can be used to satisfy a requirement of both your major and your minor. No course can be counted toward minimum requirements for more than one minor program. Transfer units cannot normally be used to satisfy minor requirements. Exceptions in use of transfer units require approval by your adviser for the minor program and the College Committee on Majors and Courses of Instruction. Even though a minor program is not required, you may choose to complete one or more minors in either this college under the guidelines above or the College of Letters and Science according to guidelines in effect for that college.

Satisfactory completion of a minor program must be certified by your adviser. If you wish to have a minor authorized and entered onto your records, obtain the

appropriate form from the Dean's Office, have your adviser certify the minor, and return the form to the Dean's Office. The filing period coincides with that for filing for degree certification (see page 4).

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 61.

Davis Campus Requirement: See page 62.

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

- Not more than 6 units can be Physical Education 1
- Not more than 20 units can be courses numbered 92, 99, 190C, 192, 197T, 197TC, or 199
- Not more than 12 units can be courses numbered 92 and/or 192
- 54 units must be upper-division work
- Not more than 9 units of professional courses (numbers 300-499) may be used toward the 54 upper-division units
- At least 7 units (which must be earned before you have completed 120 units) must be earned in courses that emphasis written and oral expression. The following UCD courses have been approved for satisfaction of this College requirement:
  1. One course must be selected from English 1, 2, 3, 20 or 103 (courses with primary emphasis on writing skills).
  2. One course from one of the courses not selected above or from English 102, 104, Comparative Literature 1, 2, 3; Philosophy 5, 10, or Rhetoric 1 (courses emphasizing either writing or speaking skills).

Residence Requirement: This requirement is the same as for the University requirement (see page 62).

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

In addition to the general requirement of a C average (2.000) for all University work undertaken, a minimum grade-point average of 2.000 is required for courses specified as depth subject matter in the major.

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

Filing for Graduation: You must file a Candidacy Card with the Registrar's Office during the specified filing periods (see page 4). You must also see your faculty adviser and complete your Major Certification; this form must be received and evaluated by the Dean's Office before your candidacy for a degree can be finalized.

COLLEGE POLICIES AND PROCEDURES

Study List and Study Plan

The study list is a record of the courses in which you enroll during a particular quarter. It should be part of a larger plan for attainment of specific long-term goals and should allow for (a) the acquisition of prerequisite knowledge for courses to be taken in subsequent quarters, (b) the fulfillment of College and major requirements, (c) a proper balance between the demands of the courses and your ability to master the subject matter, and (d) meeting the minimum progress regulation (see page 60).

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

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

Probation and Disqualification

Students are expected to make reasonable progress toward fulfilling the degree requirements. You must pass a total number of units that average 12 for each preceding three terms of enrollment on the Davis campus in order to maintain a *good standing* status. Refer to page 60 for minimum requirements for subsequent quarters of enrollment and regulations on probation and disqualification.

Passed/Not Passed Option

If you are a regular student *in good standing* , you may elect to take certain courses on a Passed/Not Passed basis. (See page 56 for complete information.)

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

Credit by Advanced Placement Examinations

(See page 59.)

Credit in Extension Courses

Students in residence may apply a maximum of 9 units of credit earned in some University Extension courses

toward the 180-unit requirement *provided* written approval has been obtained from the Dean *prior* to enrollment. Units of credit allowed by the Dean may be less than the number of units listed for a course. No grade points are assigned for courses completed through University Extension.

Transfer Students

If you transfer to UCD from another institution, the Admissions Office will determine the unit credit you will be awarded for previous work. The College evaluates the credit awarded by the Admissions Office and, upon your request, determines how many units will be counted as upper-division work. You must file a student petition for this evaluation if these courses have not been evaluated previously. 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 Programs and Courses section of this catalog have preparatory subject matter set out in a special category. These preparatory courses may be taken at the University of California or elsewhere. You can generally determine the area of knowledge covered by a specific requirement by reading the course descriptions. You need not present identical courses, only ones that have substantially similar content. If you are attending a community college, consult your counselor to determine which community college courses are appropriate and acceptable for fulfilling College of Agricultural and Environmental Sciences requirements.

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

Withdrawal

A student may be permitted to withdraw from the College for emergency reasons or for good cause (see page 55 for University policy and procedures). Consultation with the Dean is required prior to obtaining the Dean's permission to withdraw.

Registration Beyond 195 Units

A minimum of 180 units is required for a bachelor's degree. Normally, all degree requirements will be fulfilled by taking 180 to 195 units. The College of Agricultural and Environmental Sciences has discontinued its 195-unit-limitation rule. However, the College encourages you to meet your educational objectives in the most efficient manner commensurate with your educational goals.

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 of graded courses on the Davis campus during any quarter and who have a grade-point average equal to or higher than the minimum grade-point average attained by the upper 16 percent of students registered in the same class and college during the preceding quarter.

Honors at Graduation

Graduating students who are completing their majors with distinction may be recommended for honors, high honors, or highest honors. The names of these students are announced at commencement, and this distinction is noted on their records and diplomas. Honors at graduation will be awarded according to the conditions specified on page 63.

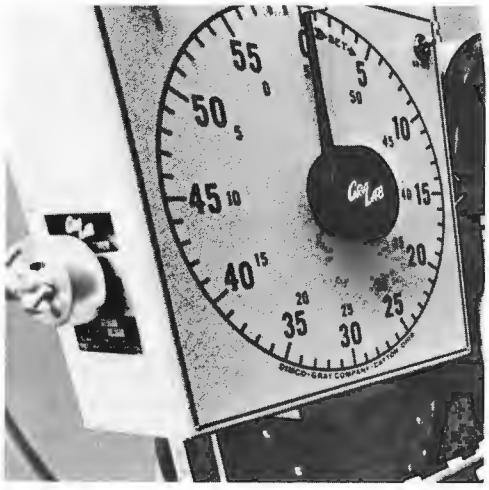
College Medal

Each year the outstanding graduating senior in the College is awarded a silver medal, known as the "Agricultural and Environmental Sciences Medal." Scholastic excellence (in a minimum of six quarters at UC Davis) is the primary basis for choosing the recipient.

Scholarships

To encourage capable young men and women to pursue careers in the agricultural and environmental sciences, many companies and private individuals have established scholarships restricted to students in this college. You are encouraged to apply for these scholarships if you have a high scholastic standing and demonstrate exceptional performance. Certain scholarships also require proof of financial need. Information is available from the Scholarship Office, or from the College Office, 228 Mrak Hall. (See also the Scholarship section, beginning on page 39.)

College of Engineering



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.

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

With the exception of the individual major, the four-year undergraduate program is divided into two parts. The first part (the Lower Division Program) is made up of mathematics, physics, chemistry, humanities and social sciences courses, and certain introductory engineering courses. The Lower Division Program is essentially the same for all engineering curricula, with the exception of Chemical Engineering, the double major in Chemical Engineering/Materials Science and Engineering and the Agricultural Engineering: Forest Engineering option. The second part (the Upper Division Program) is made up of elective courses and a group of required technical courses pertinent to your intended major. Most of your senior year is elective, to be divided between technical and non-technical courses. The major programs are outlined on pages 179 through 186.

It takes more than four years of schooling to learn all you need to know about any profession. The objective of the undergraduate programs in engineering, therefore, is to form an appropriate foundation for a lifetime of learning. Extended learning after graduation—on-the-job experience, individual study, extension courses, or formal graduate study—is an essential part of an engineering education. And since practical experience during your undergraduate years is also useful, you are encouraged to participate in engineering internship programs.

For information on graduate programs leading to the Master of Engineering, Doctor of Engineering, Master of Science, and Doctor of Philosophy degrees, or Graduate Certificate Programs, see page 81.

A.B.E.T. Accreditation

The following Engineering curricula are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.: Agricultural Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering (General), Electrical Engineering (Electronics,Circuits, and Signal Processing), Electrical Engineering (Solid-State, Microwaves and Quantum Electronics), and Mechanical Engineering.

ADMISSION TO THE COLLEGE OF ENGINEERING

Admission to Freshman Standing

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

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

These subjects are prerequisite to certain basic courses in the freshman engineering program. You will be required to make up equivalent work if you are admitted without this preparation. As a result, graduation could be delayed. A year of high school mechanical drawing is also recommended, but not required. You may be limited in your freedom to change majors within the College once you have been admitted.

Advanced Placement Examination

Credit toward the total unit requirement for the degree is awarded for CEEB Advanced Placement Examinations satisfactorily passed, as indicated in the table on page 59. Except as otherwise noted in the table, these units may be used to satisfy specific graduation requirements in the College of Engineering.

Admission to Advanced Standing

While it is possible for community college students to transfer to UC Davis after completing only the freshman year, the highest priority is given to applicants who have completed the entire lower-division program. If you choose to complete the lower-division engineering curriculum at a California community college, your studies at Davis can normally be completed within two academic years. Questions about community college programs should be directed to your school counselor, or you can contact the UC Davis College of Engineering Undergraduate Office directly. (For information on admission to the University in advanced undergraduate standing, refer to the Admissions section of this catalog.)

If you are admitted with *fewer than 84 quarter units* of college work (56 semester units), you are classified in lower-division standing, and must complete one of the three Lower-Division Programs listed on page 179. You are advanced to upper-division standing after completing 84 units.

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

Subject Areas	Minimum Quarter Units
Mathematics (calculus, differential equations, vector analysis)	18
Physical and biological sciences (at least 10 units must be in general chemistry and at least 12 units in physics for engineering and science students)	26
Engineering (lower-division subjects such as graphics, properties of materials, surveying, computer programming, statics, and circuit theory. Chemical Engineering majors may elect to take only 12 units of engineering in their Lower Division Program)	15
Written and oral expression (courses equivalent to English 1, and Rhetoric 1 or 3)	8
Humanities-social sciences (must be selected from a list of course groups approved by the Committee on Undergraduate Study)	9
Unspecified subjects (Chemical Engineering majors should take quantitative analysis and one course in organic chemistry with laboratory during their sophomore year; Agricultural Engineering—Forest Engineering option majors should take courses in biology, botany and statistics)	8
Total	**84**

Once you have completed the Lower-Division Program on this basis, it is not necessary to take additional lower-division courses, except those that are prerequisite to upper-division courses in your curriculum.

The minimum number of required units in the Lower and Upper-Division Programs varies from 180 to 212.

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

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

CHANGE OF COLLEGE AND MAJOR

Petitions for a change of major and transfer into the College of Engineering from another UCD college will be considered only from students who have completed at least 40 units of work while registered on the Davis campus, and who have completed Mathematics 21A, 21B, 21C, and Physics 8A or the equivalent on a letter-grade basis. It may be necessary to limit the number of applications that are approved, in which case selection will be based on UC grade-point averages. See page 54 for details on filing petitions.

Enrollment in Engineering 45 and in certain upper-division courses in engineering is restricted to Engineering majors. It may be necessary to restrict enrollment in other courses offered by the College without prior notice.

ACADEMIC ADVISING

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

Every undergraduate in Engineering is assigned to a faculty member for academic and career advising. Initial adviser assignments are made through the Engineering Undergraduate Office prior to your first term on campus. Engineering majors usually keep the same faculty adviser throughout the undergraduate years, but you may change to a new adviser of your choice whenever you wish. It is necessary to keep the Undergraduate Office informed of adviser selections.

You are expected to meet individually with your faculty adviser at least once each quarter. New freshmen are required to do so each quarter of the first year of enrollment, and new advanced standing transfers are required to do so for the first quarter.

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

CHOOSING A MAJOR

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

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

All Engineering majors are in the Nature and Environment category for purposes of the Davis campus General Education requirement (see page 62).

Degree requirements for each of the four double majors. listed above, can be completed within four academic years.

The Individual Engineering major is designed by you with the help of your adviser after initial enrollment in the College, and is subject to approval by the Engineering Undergraduate Study Committee. Additional information is available through the Undergraduate Office in Bainer Hall. (See also page 234.)

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

Introductory Courses

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

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

PLANNING YOUR PROGRAM

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

Specific degree requirements for the various engineering curricula are given beginning on page 179.

The minimum number of required units ranges from 180 to 212, depending on the curriculum. Programs normally require a minimum of 12 quarters of study averaging 15 units each. A regular full-time student must satisfy the requirements for minimum progress (see page 60).

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

Program Flexibility

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

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

Course Priorities for Freshmen

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

- Mathematics 11 (if not completed in high school)
- Mathematics 21A (if not completed in high school)
- English A (if the Subject A requirement is not yet otherwise satisfied)
- Other (Engineering 3 or 4, English 1 or 3, or Comparative Literature 1, 2, or 3, Chemistry 1A or 4A,

Rhetoric 1 or 3, or humanities-social sciences electives)

If you have not satisfied the Subject A requirement before entering the University, you must do so as early as possible during your first year of residence. If you have not done so after three quarters of enrollment, you will not be eligible to enroll for a fourth quarter.

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

Expanded Course Outlines

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

Special Courses

Special Study Courses: You are limited to five special study units (courses 99 and 199) per quarter. (See page 121.)

Work-Learn Programs: Internship courses numbered 92 and 192 are designed to provide practical, applied experience through the Internship Program (see page 122). Further information is available from your adviser, the respective Engineering department offices, or Work-Learn and Career Planning and Placement.

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* by 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 end of your junior year). In order to have this done, you must submit a signed Degree Check Request. Further information and forms concerning this service are available in the Engineering Undergraduate Office.

General University and Davis Campus Requirements

University requirements and the Davis Campus General Education requirement for the bachelor's degree are explained beginning on page 61.

College Requirements

Each candidate for the degree of Bachelor of Science in Engineering must satisfactorily complete an approved curriculum in engineering. Each curriculum consists of a specified Lower-Division Program (or an approved equivalent program for students who transfer into the College with 84 or more quarter units), and a specified Upper-Division Program. Detailed requirements for the approved curricula are given beginning on page 179.

In addition to the University residence requirements, you must complete:

1. at least 35 of the final 45 units characteristic of your curriculum in engineering while registered in the College;
2. with a 2.0 grade-point average all upper division courses both in your major department and in Engineering.

You may, for good cause, request a modification of particular degree requirements by submitting a student petition. These petitions, which are available in the Undergraduate Office, can be a valuable aid in solving individual program conflicts or other special problems. Such petitions are subject to approval by the Undergraduate Study Committee, a body of five professors

and five (non-voting) students. A negative decision by the Committee may be appealed to the College faculty for action at a regular meeting.

English Composition Requirement

Upon completion of 84 quarter units of college work, the English Composition requirement must be satisfied. The requirement may be fulfilled in one of two ways:

1. By passing the English Composition Examination administered by the College of Letters and Science. (It should be taken early in the junior year and must be taken prior to the last quarter before graduation.)
2. By completing English 103A with a grade of C– or higher.

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

During the 1984-85 academic year, the English Composition Examination will be offered on the following three Saturdays: October 20, January 26, and April 27. Sign-up rosters will be posted on the Letters and Science Dean's Office bulletin board, Mrak Hall foyer, Monday through Thursday just preceding each Saturday examination date. The English Composition Examination form, available at the UCD Bookstore, is required.

Degree Requirement Changes

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

Electives

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

Humanities-Social Sciences electives: Because engineers are significant agents of social change, they must be sensitive to the human setting in which that change takes place. The humanities-social sciences (HSS) electives are emphasized within the engineering curricula to increase your awareness of the human and societal implications of engineering practice. The humanities include subject areas such as literature, philosophy, history and the fine arts. The social sciences include areas such as anthropology, political science, sociology, psychology, and economics.

Each engineering program must include at least 24 quarter units from subjects in the humanities and social sciences areas. Subjects that are vocationally oriented or skills oriented, such as management and accounting, or that contain a preponderance of scientific or mathematical content, are not suitable for HSS credit even though a course may be offered by a department ordinarily classified as a humanities or social science department. Language courses must stress literature, not skills, and fine arts courses must emphasize the history and appreciation of forms of expression, not development of performance or other technical skills.

All undergraduate courses in the following list are suitable as HSS electives. You may petition for HSS credit for 92, 98, 99, 192, 197T, 198, and 199 courses in appropriate cases. If you repeat a course which may be repeated for credit, not more than 4 units of that course may be counted toward this requirement. Some of the courses on this list also satisfy the Davis Campus General Education Requirement (see page 62).

Afro-American Studies 10, 15, 100, 110, 120, 121, 133, 150A, 150B
Agrarian Studies 2
Agricultural Economics 1, 18, 100A, 100B, 112, 120, 150, 151, 169
American Studies 1A, 1E, 1F, 2, 45, 101A-H, 111, 120, 140A, 140B
Anthropology 2, 4, 101 through 108, 119 through 147, 162, 163, 190, 191
Applied Behavioral Sciences 17, 18, 19, 152, 153, 154, 162 through 172, 174, 175, 176, 177
Art 1A, 1B, 1C, 1D, 10HA, 20, 150 through 188C
Asian American Studies 1, 2, 100, 111, 112, 150, 155
Chinese 101, 111
Classics 4A, 10, 17A, 17B, 17C, 20, 40, 41, 139B, 141, 142, 150, 174
Comparative Literature 1 through 53B, 135 through 169
Consumer Science 100
Design 140A, 140B, 142A, 142B, 143, 144
Dramatic Art 15 (but not 15L), 20, 115, 150 through 159
East Asian Studies 1, 9
Economics 1A, 1B, 100, 101, 105, 110A through 175
Education 110, 116, 120, 122, 123, 130, 140, 145
English 3, 30A, 45, 46A, 46B, 46C, 110A through 189
Environmental Studies 25, 141, 142, 161
Food Science and Technology 20
French 25, 45, 107, 115 through 150
Genetics 10
Geography 2, 5, 6, 7, 10, 50, 121, 122A through 127, 141 through 161, 170, 171, 172, 173, 175
German 48, 50, 51, 52, 106, 108, 110 through 133
History 1 through 90B, 101 through 191B, 193, 194A, 194B, 194C, 194D, 194E, 195
Human Development 15, 100A, 100B, 100C, 101, 102, 103, 110, 130, 131, 132
Integrated Studies 1A through 9
Italian 25, 107 through 139C
Linguistics 102, 106, 112, 113, 114
Mathematics 10
Medieval Studies 20A, 20B, 20C, 120A-F
Mexican-American (Chicano) Studies 10, 101, 102
Music 10, 28, 29, 110A, 110B, 110C, 110D, 113A, 113B
Native American Studies 1, 10, 32, 33, 55, 70, 101 through 130C, 156, 157, 161, 180, 181A, 181B, 181C
Nutrition 20
Philosophy 1, 10A-G, 14, 21, 22, 23, 100 through 109, 114A, 114B, 117, 118, 123, 132, 143 through 176

Physical Education 36A, 36B
Political Science 1 through 7, 100 through 113, 115 through 191
Psychology 1, 16, 112, 115, 120, 131, 132, 136 through 150, 157, 159, 168, 171, 177, 183
Religious Studies 1 through 75, 100 through 172
Rhetoric 10, 103 through 143
Russian 30, 41, 42, 120 through 154
Sociology 1 through 25, 102, 110 through 176, 180A, 180B, 182, 185
Spanish 34, 35, 103A through 109, 111 through 129, 134, 135, 136, 138, 149, 150, 151
Textiles and Clothing 7
Women's Studies 50

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.

Technical elective credit up to a maximum of 6 units is allowed for any combination of engineering courses numbered 190C, 192, 197, 198, and 199. Academic credit for 199 courses is limited to a maximum of 5 units for each substantially different project. Academic credit for engineering internship courses (192's) is limited to a maximum of 5 units per quarter.

All upper-division courses in engineering, physics, chemistry, statistics (except Statistics 102), and mathematics are suitable as technical electives. In addition, the following courses may be used as technical electives:

Agricultural Economics 113, 114, 140, 147, 148, 176
Agricultural Engineering Technology 161A, 161B
Animal Science 1, 105, 118B, 133, 160
Art 121A, 121B, 121C
Astronomy 127
Atmospheric Science 20, 20L, 105, 120, 121A, 121B, 124, 125, 133, 149A
Bacteriology 2, 102, 130A
Biochemistry and Biophysics 101A, 101B
Biological Sciences 1
Chemistry 1C, 4C, 5, 8A, 8B
Ecology 201A, 201B
Economics 11A, 11B
Engineering: Computer Science 125
English 104
Environmental Planning and Management 110
Environmental Studies 100, 116, 128, 150A, 150B, 150C, 151, 160, 167, 168A, 168B, 169, 173, 178, 179
Environmental Toxicology 131
Food Science and Technology 102, 104, 108, 111, 131, 150
Genetics 100A, 100B
Geography 106, 110
Geology 1, 1L, 17, 50, 50L, 60, 105, 116, 117A, 117B, 123, 124, 134, 150A, 175
Physiology 2, 110, 120B, 120E, 149
Resource Sciences 100, 131
Soil Science 100, 102, 107, 120
Textiles and Clothing 100
Vegetable Crops 101
Water Science 41, 103, 104, 122, 141, 142, 150, 154, 160, 172, 180
Wildlife and Fisheries Biology 120, 121
Zoology 2, 2L

You are urged to discuss the selection of technical elective courses with your academic adviser.

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 56.)

While registered in the College of Engineering, you may enroll in a maximum of one course per quarter in which you choose the Passed/Not Passed (P/NP) grading option. Courses that are graded P/NP *only* may be taken simultaneously with the courses for which you exercise the Passed/Not Passed option.

In the engineering curricula, only unrestricted electives and units taken to satisfy the humanities-social sciences electives and English and rhetoric requirements, or requirements identified in the appropriate Upper Division Program as "Technical electives," may be taken on a Passed/Not Passed basis. All others must be taken for a letter grade.

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

- Be in good academic standing (not on probation or subject to dismissal)

- Carry at least 12 units, including the course to be taken P/NP
- have a P/NP petition approved by the Dean or a designated representative

HONORS

The Dean's Honors List

The Dean's Honors List is posted quarterly on the bulletin board outside the College of Engineering Undergraduate Office. This list includes the names of all undergraduate Engineering students who have completed at least 12 units during the preceding quarter, exclusive of courses taken on a Passed/Not Passed basis, and who have achieved a grade-point average equal to or higher than the minimum grade-point average attained by the upper 16 percent of those registered in the College at the same class level during that quarter. A notation is made on the student's records each time the student qualifies for the Dean's Honors List.

Honors at Graduation

Graduating students in the College of Engineering who have achieved distinguished scholarship while at the University may qualify for honors, high honors, or highest honors. The names of these students are announced at Commencement and this distinction is noted on their records and diplomas. Honors at graduation will be awarded to students who have completed at least 45 units of work at the University with a grade-point average that places them in the appropriate top percent of the graduating class in the College of Engineering. (See page 63 for details.)

College Medal

Each year outstanding senior students in Engineering

are recommended by the faculty of the College as nominees for the College of Engineering Medal. Academic excellence is the primary basis for selecting the recipient of the award.

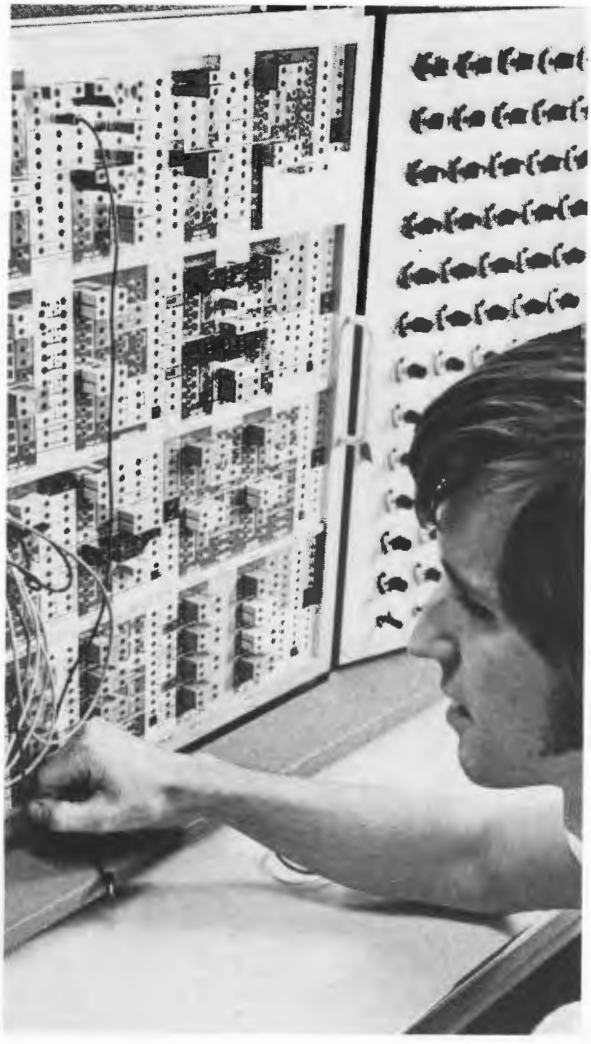
GRADUATE STUDY IN ENGINEERING

The following departments offer courses of study leading to both the Master of Science and Doctor of Philosophy degrees. Programs in these departments are particularly appropriate for those wishing to prepare for careers in teaching, research, or analytical design.

- Agricultural Engineering
- Applied Science (Davis-Livermore)
- Chemical Engineering
- Civil Engineering
- Electrical and Computer Engineering
- Mechanical Engineering

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

- Agricultural Engineering
- Civil Engineering



- Electrical and Computer Engineering (Doctor of Engineering degree *only*)
- Mechanical Engineering

Graduate students in engineering are permitted wide latitude in selecting courses and research or design subjects at both the master's and doctoral levels. A purposeful and well-integrated course of study is planned with the help of an adviser or guidance committee. A student is required to enroll in the departmental seminar each quarter while in residence.

More general information may be found in the *Graduate Announcement,* obtainable from the Dean of the Graduate Division. Detailed information on graduate study in engineering is contained in the *College of Engineering Bulletin,* available from the College Undergraduate Office.

Off-Campus Learning

Many courses in engineering, predominantly graduate-level courses, are available on the campus television network at receiving sites in Livermore and the Sacramento area. Those interested in TV classes should contact individual Engineering departments at addresses listed in the courses section.

Graduate Certificate Program

For engineers who already have a degree, the College of Engineering offers a Graduate Certificate Program. This program consists of course work in selected engineering subjects, and requires fewer units than the degree programs. The purpose of the Graduate Certificate Program is to provide practicing engineers with an opportunity to develop additional expertise in specific areas and to explore new fields of technical interest.

General requirements for the program are:

- 15 units from courses not specifically required of UC Davis undergraduate engineering majors
- At least 9 of these 15 units must be from formal graduate courses
- Graduate Division acceptance

Further information on the Graduate Certificate Program may be found in the *College of Engineering Bulletin.*

College of Letters and Science

Information:
Dean's Office
150 Mrak Hall
752-0392

The College of Letters and Science offers programs of study that expose a student to the worlds of human experience, of ideas, of artistic accomplishments, and of matter and things. These four worlds are the domains of the social sciences, the humanities, the fine arts, and the natural sciences, respectively. Although separate and distinct to the casual observer, these areas are interconnected and may be studied in a coherent curriculum. It is within this curriculum that you will be able to explore a variety of academic fields, engage in the pursuit of fundamental knowledge primarily for its own sake, and gain the capacity for independent study and thought.

A well-balanced liberal education, including in-depth study of a major field, should prepare you for a satisfying life, whatever your career. And since more and more career opportunities depend on the completion of a basic letters and science curriculum, such an education will also have a vocational value.

The main emphasis in the College remains, however, on the ends of living rather than on the means. Undergraduate education in the College stresses breadth rather than specialization.

Within the specific standards of scholarship and unit distribution that the College has established for its programs of study, there are three groups of requirements crucial to the realization of the College's educational goals: the English Composition Requirement, the Breadth Requirements, and the Major Requirements.

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

The **Breadth Requirements** provide you with a broad background of knowledge, help you to explore the interdependencies of knowledge, and acquaint you with other cultures.

The **Major Requirements** enable you to gain intellectual depth and competence in a selected area of study.

Bachelor of Arts (A.B.), Bachelor of Science (B.S.) and Bachelor of Arts and Science (B.A.S.) degrees are offered by the College. The B.A.S. degree is for those who have two majors, one normally leading to an A.B. degree and the other to a B.S. These degrees are conferred upon your completion of the University's requirements and the College's general education and major requirements detailed on the following pages.

Every student is personally responsible for seeing that these graduation requirements are met. (Changes in graduation requirements, other than those in the major, adopted after publication of the *General Catalog,* are posted on the Letters and Science bulletin board opposite 175 Mrak Hall.)

STUDENT SERVICES

Information:
Dean's Office
150 Mrak Hall
752-0392

The primary function of the Dean's Office is to assist students with questions concerning academic matters and program planning. The deans and academic counselors staff an advising service designed especially to assist undeclared students with selecting a study program and in their search for a major. All students are welcome, however, to come in for general academic advising.

This office can also help you with questions concerning College requirements, scholarship (probation and disqualification), and other academic matters. Problems which cannot be resolved by staff assistants are referred to academic deans or counselors who are regularly available to students by appointment.

The Dean's Office also performs a number of regular functions:

- Determines how your transfer credits from other institutions apply towards completion of breadth and unit requirements for the bachelor's degree (applicability of transfer credit toward the major is determined by your major faculty adviser)

  Sends you a Status Card outlining transfer credit information

- Prepares a statement of remaining College requirements, on request, for seniors (Senior Degree Check, page 92)

- Acts on petitions requiring the Dean's approval, e.g., petitions for declaration or change of major; change of study list after established deadlines; waiver of minimal progress requirements; permission to take 200-, 300-, and 400-numbered courses for degree credit; withdrawal; reentry on probation or after completion of 120 units

- Reviews the records of students who are subject to disqualification and recommends dismissal from the College or continuation on probation

ADVISING

Faculty Advising

Good advising means the difference between an exciting and an indifferent educational experience. Given the range of programs and courses offered within the College of Letters and Science, good advice is essential if students are to design an educational program that will best fit their needs and individual goals.

In the College of Letters and Science, the relationship between student and faculty adviser is largely a voluntary bond. Thus, the effectiveness of advising depends both on the perceptiveness of the adviser and the initiative of the student.

An adviser can assist you not only in meeting minimal degree requirements, but also in taking maximum advantage of the resources available in the University. Your transcripts from other colleges (your own copy is

necessary) should be made available to your adviser. You are encouraged to talk to faculty advisers in different fields to enable you to make educational decisions on the basis of the broadest possible body of information and ideas. Although degree requirements may appear many and complex, they leave substantial room for individualization of study programs. With the help of faculty advisers, you can keep open as many options as possible while still progressing toward your major degree objectives.

Remember, it is your responsibility to maintain regular contact with your faculty adviser. A good relationship is developed by meeting frequently and discussing honestly and thoughtfully your problems and expectations. A conference at least once a quarter is especially desirable for new students during their first year in the College and for seniors during the final quarters preceding graduation.

Feel free to come to the Dean's Office for consultation on any academic matter.

Advising Checkpoints. You are required to consult with your adviser at a couple of critical stages in your academic career:

- Before you complete 90 units of degree credit, including transfer work, you must develop in consultation with your faculty adviser a proposal for a quarter-by-quarter program of courses showing how you will meet your educational goals and the graduation requirements. You must also have declared a major by this time (see page 86).

  Filing this plan with your adviser *does not* preclude subsequent modifications of the plan or a change of major.

- Before you complete 135 units of degree credit, including transfer work, you must request a Senior Degree Check (page 92) from the Dean's Office and consult your adviser concerning course selection and requirements in the major.

- Before you complete 195 units of degree credit, including transfer work, you must develop in consultation with your faculty adviser a firm study plan, in the form of a quarter-by-quarter program that will satisfy all remaining degree requirements as expeditiously as possible. This plan will be filed with your adviser. If the plan indicates that you will have to register beyond the 225-unit limit (page 92) in order to achieve your goals and to meet the degree requirements, you must contact the Dean's Office immediately.

If you do not comply with these advising requirements, you will be denied registration for future quarters.

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

If your faculty adviser happens to be unavailable at a critical time, you should ask the department or program administering your major for an alternate adviser to

assist you temporarily. Department and program offices are listed in the *Class Schedule and Room Directory.*

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

If you participate in the Summer Advising and Registration Conference, you will be assisted in planning your Fall Quarter program by a temporarily assigned summer faculty adviser. You must contact the regular adviser you have been assigned during Orientation Week of the Fall Quarter.

Continuing students who have completed three quarters in residence in the College are no longer obligated to consult an adviser except at checkpoint stages (above); they are urged, however, to maintain regular contact with an adviser in their major to avoid program errors which may delay graduation.

Undeclared students who are as yet uncertain of their goals, and especially students lacking a clearly identifiable interest, are urged to make an appointment with one of the deans or academic counselors in the College Academic Advising Office (150 Mrak Hall).

Seniors should maintain close contact with their adviser in order to ensure that they are meeting the major requirements.

Peer Advising

Student-to-student advising is an important part of the University advising services. Refer to the index under "Advising" for information on the various peer advising programs.

Preprofessional Advising

The College of Letters and Science does not offer special preprofessional programs. Students who plan to prepare for a professional school undertake a normal program leading to a bachelor's degree. Most courses required by a professional school are included in the requirements for the bachelor's degree, and additional courses you need may be taken as electives. You should become aware of the requirements for prospective professional schools early in your career in order to plan a suitable program. You may obtain further assistance from the Health Sciences Advising Office, the Pre-Law Advising Office, Pre-Business Advising Office, or the Work-Learn and Career Planning and Placement Office.

TEACHING CREDENTIAL

The teacher education program is administered by the Graduate Division. See page 98 for more complete information.

THE MAJOR

There are three types of programs which satisfy requirements for the major: departmental majors, interdepartmental majors, and individual majors.

Major Programs Offered by the College of Letters and Science

Following is a list of the departmental and interdepartmental major programs offered by the College of Letters and Science. All but five of the majors offer a Bachelor of Arts degree. Those which lead to a Bachelor of Science degree as well are indicated by a footnote symbol (see below). Each Letters and Science major comes under one of the three General Education categories (see page 62): Culture and Civilization (CC), Contemporary Societies (CS), and Nature and the Environment (NE). The appropriate category is indicated immediately following the major.

Afro-American Studies (CS)
American Studies (CC)
Anthropology[1] (A.B. degree—CS; B.S. degree—NE)
Applied Physics[2] (NE)
Art History (CC)
Art Studio (CC)
Bacteriology[1] (NE)
Biochemistry[2] (NE)
Biological Sciences[1] (NE)
Botany[1] (NE)
Chemistry[1] (NE)
Classical Civilization (CC)
Comparative Literature (CC)
Computer Science and Mathematics[2] (NE)
Dramatic Art (CC)
East Asian Studies (CC)
Economics (CS)
English (CC)
French (CC)
Genetics[2] (NE)
Geography[1] (A.B. degree, emphases I, II, III, V—CS, emphasis IV—NE; B.S. degree—NE)
Geology[1] (NE)
German (CC)
Greek (CC)
History (CC)
International Relations (CS)
Italian (CC)
Latin (CC)
Linguistics (CC)
Mathematics[1] (NE)
Medieval Studies (CC)
Mexican-American (Chicano) Studies (emphasis Humanities—CC; emphasis Sociology—CS)
Music (CC)
Philosophy (CC)
Physical Education (NE)
Physics[1] (NE)
Physiology[2] (NE)
Political Science (CS)
Political Science—Public Service (CS)
Psychology[1] (NE)
Religious Studies (CC)
Rhetoric(CC)
Russian (CC)
Sociology (CS)
Sociology—Organizational Studies (CS)
Spanish (CC)
Statistics[1] (NE)
Women's Studies (CS)
Zoology[1] (NE)

[1]Offers a program leading to the Bachelor of Science degree as well as a program leading to the Bachelor of Arts degree.
[2]Offers the Bachelor of Science degree only.

Courses listed in this *catalog* under Astronomy, Chinese, Classics, Education, Integrated Studies, Japanese, Oriental Languages and Civilization, Portuguese, Scandinavian, and Swedish are taught by teaching departments or programs in the College of Letters and Science, but *no undergraduate majors* with these names now exist.

Declaration of Major

Students who have not formally declared a major must do so by the time 90 units have been acquired. If you fail to declare a major, a hold will be placed on your further registration. The hold will be removed only when your *Petition for Declaration or Change of Major* is on file in the Dean's Office. Petitions can be obtained from faculty advisers or the offices administering the respective major programs. Office locations are published in the *Class Schedule and Room Directory* each quarter. 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 approved the petition. The department or curriculum committee supervising the major program will assign you to a faculty adviser.

To be accepted into a major, you must have a C average in all courses you have completed that are a requirement for that major, as well as a C average in the upper-division courses you have taken toward the major. Additional requirements, such as completion of a particular set of required courses with a specified grade-point average (usually well above a C average) may be introduced as conditions for acceptance into any major at any time.

As this is written, admission into the following majors and programs is restricted and subject to specific course and grade-point requirements: Computer Science and Mathematics, Geology, Mathematics, pre-Computer Science, pre-Mathematics, pre-Statistics, Statistics. Requirements for other majors are shown in the program entry in the Programs and Courses section of this catalog. The criteria given are the minimal requirements you must meet in order to apply to the major, but satisfying the minimal criteria does not guarantee admission, which requires approval by the department or program faculty and the Dean. When the number of applications exceeds the number of spaces available—as will be the case in several of these programs—you may expect that the grade-point average needed for admission will be significantly higher than the minimum listed.

Individual Major

The individual major is a program organized by a student in consultation with faculty advisers who are expert in the requisite fields of interest. If you wish to undertake an individual major, request the appropriate forms, which include detailed instructions, from the Dean's Office, 150 Mrak Hall. Program requirements are outlined on page 234.

Multiple Majors

If you are interested in two or more areas of study, you should consider the possibility of pursuing your goals by completing one or more of the optional minors offered by the College along with your major. This is usually the best approach from an educational point of view and offers maximum flexibility in planning your program of courses. The alternative, and most common type of multiple major, is the double major, which leaves considerably less freedom of choice.

After endorsement of the major petitions by the appropriate faculty advisers, the Dean may approve declaration of more than one major if there are significant differences between the requirements of the major programs involved. Approval is subject to the following conditions:

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

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

2. At the time of request, a substantial part of the preparatory subject matter for both majors must have been successfully completed.

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

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

1. *in the following group: Anthropology (B.S. degree), Bacteriology, Biochemistry, Biological Sciences, Botany, Genetics, Physiology, Psychology (B.S. degree), and Zoology;*
2. *offered by the same department or program;*
3. *that include an individual major;*
4. *subject to admission restrictions by any of the (three) undergraduate colleges; or*
5. *that do not differ significantly in disciplinary content, independent of actual overlap of courses.*

Requests for multiple majors must be based on sound academic and educational considerations. Frequently, when a major (whether departmental, interdepartmental, or individual) is supplemented with a carefully selected program of courses or a minor that supports and amplifies your special interest, your educational goals are better served than when two or more major programs are studied in their entirety.

Effective Fall Quarter 1984, if a student completes all requirements for approved multiple majors in which one major normally leads to an A.B. degree and another normally leads to a B.S. degree, that student will receive a B.A.S. degree. A single degree is granted to students that graduate with multiple majors.

Cross-College Major

You may simultaneously pursue major programs in two undergraduate colleges on the Davis campus. The same conditions and criteria apply as for multiple majors (see above). Cross-college programs will not be approved if the majors involved are available within a

single college as well. For example, cross-college programs between the Colleges of Letters and Science and Agricultural and Environmental Sciences will not be approved if one of the majors is Bacteriology, Biochemistry, Biological Sciences, Botany, Genetics, Physiology, or Zoology.

Change of Major Within the College

You may change from one major to another within the College with the Dean's approval. Consent of the department or committee in charge of your proposed new major is also required. Admission into a major program may be denied if your grade-point average in courses required for the selected major is less than 2.000.

Procedures for change of major within the College are the same as for declaration of major (see page 86), and the same conditions apply. If you wish to change to a major that has admission restrictions, you must comply with the special procedures and requirements for that major.

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

Change of Major Accompanied by Change of College

In order to change from one college to another, you must be in good standing (not on probation or subject to disqualification).

If you are in good academic standing and want to transfer into the College of Letters and Science, you must petition to do so within the first five weeks of the quarter. Petitions, which are available at the Registrar's Office and the Dean's Office, must be endorsed by your new faculty adviser and signed by your former College Dean before being submitted to the Letters and Science Dean for consideration and approval.

A 2.000 grade-point average in the courses required for the new major is usually necessary at the time of transfer. Requests for changes of major from students in senior standing may be approved only under unusual circumstances, but in no case the quarter of graduation.

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 grade-point criteria for graduation:

You must have an average of at least 2.000 for all UCD courses required for the major; you must also have at least a 2.000 average for all upper division courses required for the major. To obtain these minimal averages in the major, you may, *with approval of your adviser,* repeat courses that are graded D or F. If you have to repeat a course more than once, you need the Dean's approval.

A department or curriculum committee may refuse to accept you into a major they administer if you do not have at least a 2.000 average in the courses required for the major.

If your performance is unsatisfactory (less than 2.000) after you have declared a major program, you may be required to withdraw from that major by the Dean, upon written recommendation from the chairperson of the department or the curriculum committee that administers the major.

THE MINOR

Teaching departments and programs may offer optional minor programs to students in the College of Letters and Science. Completion of a minor is not required for graduation, but you may elect to satisfy the requirements of one or more minors and have completion of the minor(s) certified on your transcript. Most teaching departments and programs that offer a minor program list course requirements in the Programs and Courses section of this catalog. Following is a list of those minors:

Afro-American Studies
American Studies
Anthropology
Art History
Art Studio
Biological Sciences
Botany
Comparative Literature
Dramatic Art
East Asian Studies
Education
English
French
Geography
Geology
German
Greek
History
Italian
Latin
Linguistics
Mathematics
Mexican-American (Chicano) Studies
Music
Oriental Languages and Civilizations (by arrangement)
Philosophy
Physical Education
Physics
Political Science
Psychology
Religious Studies
Rhetoric
Russian
Sociology
Spanish
Statistics
Women's Studies

Certification of a minor on the transcript indicates that you have completed a coherent program of courses in an area of interest outside your major. The minor may complement your major, but it is not particularly meaningful unless the field of study is significantly different from that of your major.

A minor consists of 18 to 24 units in upper-division courses specified by the department or program. At least half of these units and courses must be completed in residence on the Davis campus. You are also expected to complete all courses that are prerequisite to the upper-division courses. In order to request certification of a minor, you must have a grade-point average of 2.000 in all courses required for the minor. At

most, one course used in satisfaction of your major may be applied to your minor. If you elect more than one minor, these minors may not have any courses in common.

Some departments and programs do not offer a minor, while others may offer several. You can elect only one minor in a subject area. If the department or program you are interested in does not list a minor in this catalog, check with that department or program office. Letters and Science students may elect minor programs approved by the College of Agricultural and Environmental Sciences. These programs are listed on page 70.

If you want to have completion of a minor certified on your transcript, you must file a request with the Letters and Science Dean's Office in the quarter preceding graduation. Thus, June graduates have to file during the Winter Quarter. The minor does not have to be completed when you file your request, but requirements must be satisfied at the time of graduation. The Dean's Office has forms available for this purpose. See page 4 for specific deadlines.

REQUIREMENTS FOR THE BACHELOR'S DEGREE

University Requirements

University requirements for the bachelor's degree are described beginning on page 61.

UCD Requirement

The General Education requirement for the bachelor's degree is described on page 62.

College Requirements

Unit Requirements. A minimum of 180 units is required for the bachelor's degree (see page 90 for restrictions on credits that may be counted toward the 180 units). Of these units, 64 must be upper-division units which include 48 units from Letters and Science teaching departments and programs.

For the A.B. degree, a minimum of 12 of the 48 units of upper-division Letters and Science courses must be from outside the major department or program. All upper division General Education courses will be accepted as upper-division Letters and Science courses. Nonstandard courses (see Area Requirement List below) do not count toward these 12 units.

English Composition Requirement. The English Composition requirement can be met in one of two ways:

1. by passing the English Composition Examination (see page 91) upon completion of 70 units of degree credit (the examination does not yield credit);
   OR
2. by completing with a grade of C – (or P) or better
   a. one course in English composition from English 1, 2, 3, 20, Comparative Literature 1, 2, or 3;
      AND
   b. English 102 or 103 (which must be taken after 84 units have been completed).

Breadth Requirements. The two requirements that comprise the breadth requirements are:

1. **Foreign Language requirement**
   A.B. degree—the 12-unit level or the equivalent in one language (see page 91 for details).

   B.S. degree—none.
2. **Area requirements**
   A.B. degree—a total of 52 units in social sciences, humanities and fine arts, and natural sciences/mathematics with a minimum of 12 units in each area. For this requirement a maximum of 20 units may be counted toward any one area. Twelve units of *upper-division* courses must be offered by Letters and Science teaching departments other than the major department or program.

   B.S. degree—a total of 90 units in natural sciences/mathematics; and a total of 20 units in social sciences and/or humanities and fine arts.

General Education courses listed on the Area Requirement List simultaneously satisfy both the College Area requirement and the campus General Education requirement.

Major Program Requirements. Requirements for major programs are described in the Programs and Courses section of this catalog, beginning on page 125. These requirements are fulfilled by completing a major program offered by a teaching department or program committee in the College of Letters and Science (see page 85 for a list of majors) or an individual major program approved by the College's Committee on Individual Majors (see page 86).

No more than 6 units in internship courses (numbered 92, 192, or similar work-learn courses), may be accepted in satisfaction of the requirements of major programs. Courses numbered 97T, 97TC, 197T, and 197TC do not satisfy unit and course requirements in the major.

Scholarship Requirements. The minimum grade-point average is 2.000 for all courses counted toward the major and for all upper division courses used to satisfy major requirements. Only grades earned in courses taken at UCD will be included in the grade-point computations.

Residence Requirement. While registered in the College of Letters and Science a minimum of 27 upper-division units, including 18 upper-division units in the

major, must be completed on the Davis campus. For University requirements, see page 62. (Work completed while enrolled in the Education Abroad Program does not satisfy campus or College Residence requirements.)

Area Requirement List

Courses numbered 92, 97T, 97TC, 98, 192, 197T, 197TC, 198, and from 200 through 499 cannot be counted toward satisfaction of the Area requirements or toward the 12 units of upper-division Letters and Science courses required outside the major for the A.B. degree. A maximum of 10 units in special study courses (99, 194H, 199) may be counted toward Area requirements. Courses used to satisfy the English Composition and Foreign Language requirements may not be counted toward the area requirement. Subject to the restrictions just listed, courses acceptable for fulfilling breadth requirements are classified as follows:

Humanities and Fine Arts

Afro-American Studies 10.
American Studies. A.B. degree: equally divide a maximum of 16 units between humanities/fine arts and social sciences. B.S degree: 12 units allowed toward social sciences and humanities/fine arts.
Art.
Asian American Studies 1, 150A.
Cantonese 2, 3, 4, 5, 6.
Classics.
Comparative Literature. All courses except *first* course taken from either 1, 2, 3 (or English 1, 2, 3, 5F, 5P). All subsequent courses in Comparative Literature may be counted toward humanities/fine arts.
Dramatic Art.
English. All courses except A, 25, 26, 28, and *first* course taken from 1, 2, 3, 5F, and 5P (and Comparative Literature 1, 2, and 3). If English 102 or 103 is used in partial satisfaction of the English composition requirement (course option), it may not be counted toward humanities credit.
Foreign language. A.B. degree: all courses in foreign language departments, including literature courses, except the first 12 units of course work (course 2 or the equivalent in most languages offered on the Davis campus) in the language offered in satisfaction of foreign language requirement.
History.
Linguistics 1, 106, 107, 196.
Medieval Studies.
Music.
Native American Studies 32, 33, 34, 55, 101, 156, 157, 181A, 181B, 181C.
Philosophy.
Religious Studies.
Rhetoric.

Social Sciences

Afro-American Studies 100, 101, 110, 120, 121.
American Studies. (See Humanities and Fine Arts above.)
Anthropology. All courses except 1, 5, 15, 151, 152, 153, 154A, 154B, 155, 156, 195, 196.
Asian American Studies 2, 100, 110, 111.
Chicano Studies 10.
Economics. All courses except 12.
Education. All courses except 114.
Geography. All courses except 1, 3, 102, 105, 106, 107, 108, 110, 112, 115, 117.
Linguistics. All courses except 1, 106, 107, 196.
Native American Studies 10, 112, 116, 130A, 130B, 130C, 180.
Physical Education 120, 121.
Political Science.
Psychology. All courses except 15, 41, 103, 105, 108, 129, 134, 150, 154, 165, 177, 180B.
Sociology. All courses except 46A, 46B, 106.
Women's Studies 50.

Natural Sciences and Mathematics

Anthropology 1, 5, 15, 151, 152, 153, 154A, 154B, 155, 156, 157.
Astronomy.
Bacteriology.
Biochemistry and Biophysics.
Biological Sciences. All courses except 19.
Botany.
Chemistry.
Engineering: Computer Science.
Engineering: Electrical and Computer 180, 185.
Entomology 10, 100.
Genetics.
Geography 1, 3, 108, 110, 112, 115, 117.
Geology.
Human Anatomy 101.
Mathematics.
Physical Education 101, 102, 103, 110, 111, 112 through 115.
Physics.
Physiology.
Psychology 15, 108, 129, 134, 150, 154, 180B.
Statistics.
Zoology.

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 54.

CREDIT FOR COURSES

Advanced Placement Examinations. For credit allowed on units earned through Advanced Placement Examinations, see page 59.

Education Abroad Program. Full University credit may be awarded for courses taken through the Education Abroad Program. See page 18 for further information.

Extension Courses. Students in residence may apply credit earned in University Extension courses toward the 180-unit requirement, only when written approval has been obtained from the Dean *prior* to enrollment. The degree credit allowed by the Dean for Extension courses is usually less than the unit value listed in the course description. A maximum of 9 units may be offered for elective credit only. Such units and courses may not be applied toward fulfillment of the Area, Foreign

Language, Upper-Division, or Senior Residence requirements of the College. No grade points are assigned for courses completed in University Extension.

Graduate and Professional Courses. You must obtain the recommendation of the instructor in charge and the department chairperson—in addition to approval from the Dean—prior to enrollment in order to receive elective credit toward the degree for the following kinds of courses:

- Graduate courses 200-298
- Professional courses for teachers (300-398 courses offered outside of the College of Letters and Science)
- Postgraduate professional courses 400-498 offered by professional schools (Courses in this series which are offered by teaching departments and programs in the College of Letters and Science do not require the Dean's approval.)
- All variable-unit courses in the 200, 300, and 400 series

Special-study courses in the graduate and professional series, such as courses 299, 399, and 499 do not satisfy degree requirements. Undergraduate students in the College cannot receive credit for such courses.

Before enrolling in graduate or professional courses, you must meet certain minimal conditions. You must have an overall UC grade-point average of 3.3 and 18 units of upper-division instruction in subject matter basic to the course. Exceptions may be considered if your preparation warrants.

You may count 9 units in courses numbered 200 through 298 and a combined total of 9 units in the 300 and 400 series as elective credit toward the degree. Units earned in courses in the 200, 300, and 400 series do not count as upper-division units and nonstandard courses in these series are included in the 30-unit limit on nonstandard courses.

Internship Courses. Student internships (generally courses numbered 92 and 192) are available through many Letters and Science departments. You must have completed a minimum of 84 units before credit will be allowed for an upper-division internship course. Internships offer students the opportunity to apply classroom learning, to experience various work stituations, and to test their career objectives.

Unit Credit Limitations. For certain courses, limits have been established for the number of units that can be counted towards the 180-unit minimum required for the degree. To avoid discovering just before graduation that you are short units, keep track of the number of units you have taken in each of the following categories:

Professional courses (300 and 400 series, except numbers 399 and 499): 9 units maximum. (See under Graduate and Professional Courses above.)

Extension courses: 9 units maximum by petition. (See Extension Courses above.)

Graduate courses: 9 units maximum by petition. (See Graduate and Professional Courses above.)

Internship courses (numbers 92, 192): 12 units maximum including internship units taken at other institutions. (See under Nonstandard courses below.)

Nonstandard courses (92, 97T, 97TC, 99, 192, 194H, 197T, 197TC, 199 and similar courses): 30 units maximum or one-sixth of the units taken at UCD, whichever is the smaller. (Note separate unit limits on internship, special study, and tutoring courses; and major limitations, page 89.)

Passed/Not Passed Courses: Maximum of one-fourth of UCD units graded "P" taken at student's option. (Note limitations, page 56.)

Physical Education 1: 6 units maximum.

Special Study courses (99, 194H, 199): 5 units maximum in any one quarter. (See under Nonstandard courses above.)

Tutoring courses (97T, 97TC, 197T, 197TC): 10 units maximum. (See under Nonstandard courses above.)

Repeated Courses. You may repeat a course in which you received a D, F, or NP. If the course you would like to repeat is part of a sequence (e.g., Mathematics 16A, 16B, 16C) and you have already passed a subsequent course in the sequence (e.g., you want to repeat Mathematics 16A, but you have already passed Mathematics 16C), you should check with the Dean's Office and the department regarding whether you can receive grade-point and/or unit credit. (See also page 57.)

Transfer Courses in English Composition. Transfer courses considered by the Dean to be equivalent or comparable to English 1, 2, 3, 20, 103A-G, or Comparative Literature 1, 2, 3 will be accepted toward satisfaction of the requirement. Note that English 103 or the equivalent must be taken after you have completed 84 units of transferable degree credit.

If your transfer work does not include an acceptable English composition course taken after you had completed or accumulated 84 units, you may fulfill the requirement by examination (see below) or take English 102 or 103 at Davis.

ENGLISH COMPOSITION EXAMINATION

The English Composition requirement can be met with a passing score in the English Composition Examination.

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

October 20, 1984
January 26, 1985
April 27, 1985

You are advised to complete this requirement in your junior year. There are no examinations administered during the summer.

Sign-up rosters will be posted on the Dean's Office bulletin board, Mrak Hall foyer, Monday through Thursday just preceding each Saturday examination date.

The English Composition Examination form, available at the UCD Bookstore, is required.

FOREIGN LANGUAGE REQUIREMENT (A.B. degree)

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

You may also satisfy this requirement by examination in a language not offered on the Davis campus. In this case, the Dean's Office will assist you in making arrangements to take an examination on another University of California campus, with a faculty member who teaches the language in question.

Satisfaction of the Requirement. The Foreign Language Requirement should be completed by the end of your first or second year, as program priorities permit. This is particularly important if you plan to apply for the University's Education Abroad Program (junior year abroad).

The Foreign Language requirement may be satisfied by examination or completion of language courses as follows:

1. Foreign Language Placement Test. This test does not yield unit credit—it only determines whether the Foreign Language requirement has been met, or at which point in the language sequence you should enroll.

If you are a transfer student, you may validate your knowledge of a language learned in high school by taking this test. A test may not be taken, however, in a language for which you have already received degree credit. Consult your *Status Card,* which is issued by the Dean's Office prior to admission to the College.

2. CEEB Achievement Test. Earning a qualifying score of at least 500 on a College Entrance Examination Board (CEEB) Foreign Language Achievement Test satisfies the requirement. This test may be taken at any time during your high school career. Once your score is on file at the Undergraduate Admissions Office you should petition for satisfaction of the Foreign Language requirement at the Letters and Science Dean's Office.

3. CEEB Advanced Placement Examination. A score of 5, 4, or 3 on any foreign language College Entrance Examination Board (CEEB) Advanced Placement Examination taken in high school will satisfy the Foreign Language requirement.

4. Course Completion in College (or the equivalent). A.B. degree: 12-unit level in one language (e.g., Spanish 2 or Latin 3). B.S degree: as required in the major program.

If you have successfully completed (C – or better) the second or third year of a language in the 10th or higher grade in high school you may receive unit credit for course 1 of that language on a P/NP grading basis only.

5. Proficiency Examination. If you have not completed the required level language course, but assume you have attained equivalent knowledge, you may satisfy the language requirement by passing a proficiency examination. For more information consult the appropriate foreign language department.

PASSED/NOT PASSED GRADING

Filing Procedures

Passed/Not Passed petitions are available for students in good academic standing in the Dean's Office, 150 Mrak Hall, on the dates listed in the *Class Schedule and Room Directory,* and must be filed in person.

No signature other than yours is required on the petition. For detailed information, see page 56.

"In your first quarters at Davis it's important to establish yourself academically, but then allow yourself to discover other opportunities the campus has to offer."

- Sophomore, Political Science

Graduating seniors, and other students planning to undertake graduate or professional studies, should consult an adviser before petitioning for Passed/Not Passed in courses required for the major program.

Limitation on Credit for Units Graded P

Excluding courses which are graded on a Passed/Not Passed (P/NP) basis *only, the number of units graded P that may be accepted towards a degree in the College of Letters and Science is limited to not more than one-fourth* of the units completed in residence on the Davis campus.

The Academic Senate limits the *total* number of courses graded P, *including units earned in courses graded* "P/NP only," to *one-third* of the units completed on the Davis campus. This limitation applies to *all* Davis undergraduates, including Letters and Science students (see page 56).

REGISTRATION BEYOND THE 225-UNIT LIMIT

A minimum of 180 units is required for the bachelor's degree, and you are normally expected to fulfill all degree requirements within the 180- to 225-unit range. Once 225 units have been completed, you may register only with the permission of the Dean. Permission may be granted for sound educational reasons and for a limited time. You will be expected to adhere to a program of courses agreed upon and to meet other conditions that may have been set. Approval must be obtained before course enrollment materials can be made available to you for the quarter following completion of 225 or more units.

If you are in good standing, you will be able to complete 12 quarters or the equivalent (e.g., four years) of college work even if you have earned more than 225 units before you finish your fourth year. You must petition for continuation, however, and file the quarter-by-quarter course program you have planned.

SENIOR DEGREE CHECK

Before the beginning of your senior year, you should take some time to consider your goals and to plan the academic program for your final year as an undergraduate. To plan properly so that you will get the most out of your remaining education and complete all graduation requirements as well, you should know what requirements are left to do. To help you in these efforts, the College requires that you obtain a completed degree check from the Dean's Office and a check of major requirements from your faculty adviser before you accumulate a total of 135 units of degree credit.

You will be denied registration for future quarters if you do not comply with this requirement. Completion of your senior degree check could take seven or eight weeks. You are advised, therefore, to request a degree check from the Dean's Office well ahead of the time you will need it in order to avoid a delay in your registration.

UNIT LIMITATIONS

Ordinarily, a full-time student is expected to take an average of no fewer than 12 units a quarter. (Note the Minimal Progress requirements on page 60.) The normal workload of a full-time student is 15 to 16 units.

Students in their freshman year and transfer students in their first quarter of residence may not take more than 17 units each quarter. For all other Letters and Science students, the study list may not exceed 21 units each quarter.

These unit limitations include non-credit remedial courses and repeated courses, but make-up work to remove incomplete grades is not included.

HONORS

The Dean's Honors List

In order to be placed on the Dean's Honors List at the end of a regular quarter, you must satisfy two criteria:

1. Complete at least 12 units for a letter grade during that quarter;
2. Earn a grade-point average, for that quarter, that places you in the upper 16 percent of the students registered in your class level.

To remain on the Honors List you must meet these same standards every quarter. This list is posted quarterly on the College bulletin board in the foyer of Mrak Hall.

Honors with the Bachelor's Degree

Three categories of honors are awarded at graduation, honors, high honors, and highest honors. For minimum grade-point requirements for each category see page 63.

Recommendation from the major department, requested by the Dean's Office, is also required if you are eligible for highest honors. In some departments and programs completion of an honors program or thesis is an additional requirement for "highest honors."

You will not be awarded honors with the bachelor's degree if more than eight units of grade I (Incomplete) appear on your transcript. The College Committee on Honors may consider exceptions to this condition. Petitions for this purpose should be submitted to the Dean's Office.

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.

The Graduate Division

The Graduate Division

Information:
252 Mrak Hall
752-0650

The Graduate Division is the academic home of approximately 3,000 post-baccalaureate students who are seeking advanced degrees in more than 75 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.

Davis graduate programs are administered either by departments or graduate groups. Graduate groups are composed of individual faculty members with similar disciplinary or research interests. The group structure, unique to Davis, permits faculty to be affiliated with graduate programs in more than one discipline and offers students flexibility and breadth by crossing the administrative boundaries of the various departments, colleges, schools and sometimes campuses. Conforming well to UCD's progressive spirit, the group structure also allows for expansion of established degree programs and facilitates development of new ones. Almost half of the graduate programs at Davis are sponsored by graduate groups.

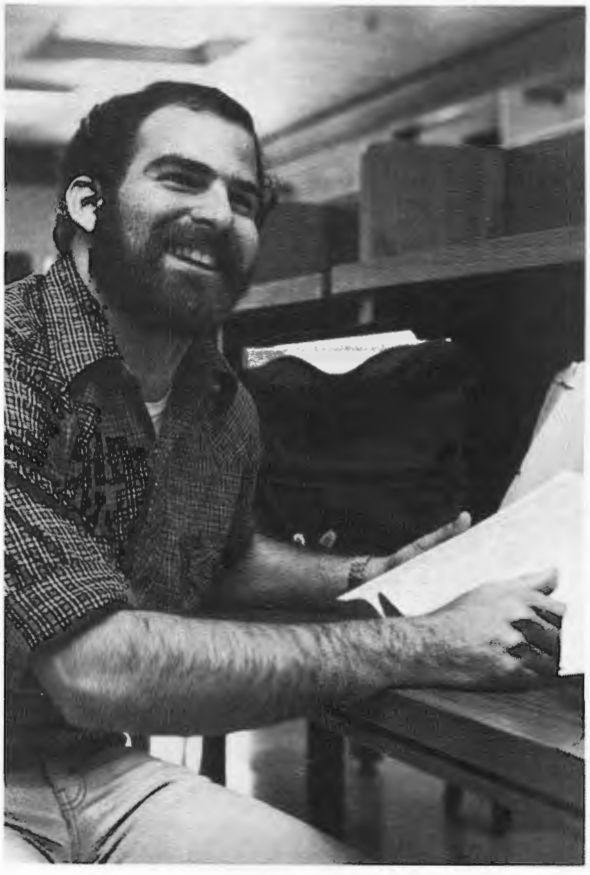
ADVANCED DEGREE PROGRAMS AT DAVIS

The following advanced degrees are offered at UC Davis: Master of Administration, Master of Agriculture and Management, Master of Arts, Master of Science, Master of Fine Arts, Master of Arts in Teaching, Master of Engineering, Master of 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 *Graduate Announcement*. Specific requirements are available from the office or chairperson of the graduate program or group concerned.

Majors and Degrees

Administration (M.Admin.)—refer to Graduate School of Administration
Agricultural and Environmental Chemistry (M.S., Ph.D.)
Agricultural Economics (M.S., Ph.D.)
Agronomy (M.S.)
Anatomy (M.S., Ph.D.)
Animal Behavior (Ph.D.)
Animal Science (M.S., M.A.M.)
Anthropology (M.A., Ph.D.)
Art (M.F.A.)
Atmospheric Science (M.S., Ph.D.)
Avian Sciences (M.S.)
Biochemistry (M.S., Ph.D.)
Biomedical Engineering (M.S., Ph.D.)
Biophysics (M.S., Ph.D.)
Botany (M.S., Ph.D.)
Cell and Developmental Biology (Ph.D.)
Chemistry (M.S., Ph.D.)
Child Development (M.S.)
Classics (M.A.)
Community Development (M.S.)
Comparative Literature (M.A., Ph.D.)
Comparative Pathology (M.S., Ph.D.)
Computing Science (M.S., Ph.D.)
Dramatic Art (M.A., M.F.A., Ph.D.)
Earth Sciences and Resources (M.S., Ph.D.)
Ecology (M.S., Ph.D.)
Economics (M.A., Ph.D.)
Education (M.A., M.Ed.)
Endocrinology (M.A., Ph.D.)
Engineering (M. Engr., M.S., D. Engr., Ph.D.)
English (M.A., Ph.D.)
Entomology (M.S., Ph.D.)
Food Science (M.S.)
French (M.A., Ph.D.)
Genetics (M.S., Ph.D.)
Geography (M.A., Ph.D.)
Geology (M.S., Ph.D.)
German (M.A., Ph.D.)
History (M.A., M.A.T., Ph.D.)
History of Art (M.A.)
Horticulture (M.S.)
Immunology (M.S., Ph.D.)
International Agricultural Development (M.S.)



Law (J.D.)—refer to School of Law
Linguistics (M.A.)
Mathematics (M.A., M.A.T., Ph.D.)
Medicine (M.D.)—refer to School of Medicine
Microbiology (M.A., Ph.D.)
Music (M.A., M.A.T.)
Nutrition (M.S., Ph.D.)
Pharmacology and Toxicology (M.S., Ph.D.)
Philosophy (M.A., Ph.D.)
Physical Education (M.A.)
Physics (M.A., Ph.D.)
Physiology (M.S., Ph.D.)
Plant Pathology (M.S., Ph.D.)
Plant Physiology (M.S., Ph.D.)
Plant Protection and Pest Management (M.S.)
Political Science (M.A., Ph.D.)
Preventive Veterinary Medicine (M.P.V.M.)—refer to School of Veterinary Medicine
Psychology (M.A., Ph.D.)
Range and Wildlands Science (M.S.)
Rhetoric (M.A.)
Russian (M.A.)
Sociology (M.A., Ph.D.)
Soil Science (M.S., Ph.D.)
Spanish (M.A., Ph.D.)
Statistics (M.S., Ph.D.)
Textiles (M.S.)
Vegetable Crops (M.S.)
Veterinary Medicine (D.V.M.)—refer to School of Veterinary Medicine
Water Science (M.S.)
Zoology (M.A., Ph.D.)

Graduate Group Programs

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 of study, write to the group chairperson for more information. These programs are also entered alphabetically in the Programs and Courses section of this Catalog, along with mailing addresses.

Agricultural and Environmental Chemistry
Anatomy
Animal Behavior
Applied Mathematics
Atmospheric Science
Avian Sciences
Biochemistry
Biomedical Engineering
Biophysics
Botany
Cell and Developmental Biology
Child Development
Community Development
Comparative Literature
Comparative Pathology
Computing Science
Earth Sciences and Resources
Ecology
Endocrinology
Engineering
Food Science
Genetics
Horticulture
Immunology
International Agricultural Development
Linguistics
Master of Education
Microbiology
Nutrition
Pharmacology and Toxicology
Physiology
Plant Physiology
Plant Protection and Pest Management
Preventive Veterinary Medicine
Range and Wildlands Science
Soil Science
Statistics
Textiles
Water Science

APPLYING FOR ADMISSIONS

Admission to a graduate program at the University of California requires a bachelor's degree that is comparable to a degree from the University of California both in distribution of academic subject matter and in scholarship achievement.

The primary requirement for admission to any program is evidence of intellectual achievement and promise. Your application will be evaluated by both the Graduate Division and the graduate program to which you apply primarily on the basis of your transcript to assure that your qualifications meet minimum standards as set by Universitywide and UC Davis Graduate Councils. Generally, to be considered for admission, you must have a minimum B average in undergraduate coursework. Graduate programs frequently require that you submit additional materials, such as a separate application form, Graduate Record Examination (GRE) scores, letters of recommendation, or examples of written work to assist them in selecting from qualified applicants. Not all eligible applicants can be admitted.

You should begin the application process as early as possible in the academic year since some programs have early deadlines and some accept applications for the Fall Quarter only. In addition, your chances for receiving financial support are greatly enhanced by applying early. Applications must be on file in the Graduate Division by the following deadlines:

June 1 for Fall Quarter

October 1 for Winter Quarter

January 1 for Spring Quarter

Contact the Graduate Division for the Combined Application for Admission and Fellowship Form.

The completed application form along with the $35 nonrefundable application fee and official transcripts from each college and university you have attended must be sent directly to the Graduate Division. Supplemental application materials required by the major program must be sent directly to the graduate adviser for that program. When all application materials have been received by the Graduate Division, they will generally be forwarded to your proposed major program, where they will be evaluated along with the supplemental materials you have sent to the Program adviser. The

"You can receive an excellent education, get practical experience, and rely on the school's reputation to make the job hunt a little easier."

- Senior, Zoology

Graduate Admissions Advisory Committee for the respective program will submit its recommendation and evaluation to the Graduate Division; final admission decisions rest with the Dean of Graduate Studies and Research. This approval procedure applies to all applicants, including those seeking a transfer to UC Davis from another UC campus.

Applications for programs leading to a teaching credential or specialist credential, and for the degrees of Juris Doctor, Doctor of Medicine, Doctor of Veterinary Medicine, Master of Administration, and Master of Preventive Veterinary Medicine must be filed directly with the appropriate department or professional school.

Readmission

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 Readmission Application Fee of $35 at least six weeks before the beginning of the quarter in which you plan to enroll (see page 5). The application is obtained from the Graduate Division Office. Transcripts of all work undertaken since you were last registered in graduate status at Davis must be presented with the application. (There is no assurance of reentry, as applicants for readmission will be considered in competition with other applicants for the program.)

International Students

If you are an international student with credentials from universities outside the U.S., you should begin the application process as early as a year before the opening of the quarter in which you wish to enroll. Official copies or certified (not notarized) copies of all transcripts in English are required before processing of your application can begin. Completed applications along with the nonrefundable $35 application fee must be received from international students by the following deadlines:

May 1 for Fall Quarter

September 1 for Winter Quarter

December 1 for Spring Quarter

English Requirement. If English is not your native language and you have not studied at an institution where English was the language of instruction, you will be required to demonstrate proficiency in English by submitting your test scores from the Test of English as a Foreign Language (TOEFL). This test is given six times each year by the Educational Testing Service, Post Office Box 899, Princeton, NJ 08541. The minimum score required for admission to graduate study at UC Davis is 550.

If you are admitted, even though you received a 550 or better score on the TOEFL, you will be required to take a special examination in English on the Davis campus before you register. This examination is to determine whether you can profit from coursework at the graduate level with English as the medium of instruction and submit acceptable scholarly work in that language. If you do not receive a satisfactory score on this examination, you will be assigned to remedial coursework and your graduate program may be deferred until your command of English is considered adequate.

Visas. If you need a Certificate of Eligibility for a student visa issued by UC Davis, you will be required to complete a Certification of Finances form showing the availability of sufficient funding for your graduate program (see page 29 for complete details). Prior to registration, you will be required to sign a statement, either the Statement of Responsibilities for a Privately Funded Student or the Statement of Responsibilities for a Sponsored Student, to show that you are able to undertake this level of expense for your education at UC Davis. No financial aid of any kind (grants, loans, fellowships, scholarships, or work-study awards) is available to international students during their first year of enrollment at UC Davis.

Graduate Study Without an Advanced Degree Objective

If you do not wish to pursue a degree but have educational objectives which require some graduate coursework, you may apply for "Coursework Only" in a specific graduate program. Your program of study must demonstrate definite scholarly or professional purpose, and you must meet regular admission standards and filing deadlines.

GENERAL REQUIREMENTS FOR ADVANCED DEGREES

A graduate degree is awarded to recognize a student's command of a wide range of knowledge in an academic field. It is not awarded merely for the fulfillment of technical requirements, such as residence, or the completion of specific courses.

Master's Degree

Students working toward a master's degree must be registered in residence for at least three quarters. Two regular six-week Summer Sessions may count as the equivalent of one quarter. Usually, all work for the master's degree is done in residence on the Davis campus. With the consent of the graduate adviser and the Dean of the Graduate Division, however, some work taken elsewhere may be credited toward your degree. The normal limit for such transfer credit is 6 units from another institution or up to one-half of the unit requirement in courses from another campus of the University—if the units were not used to satisfy the requirements for another degree.

A master's degree may be awarded upon completion of one of two basic plans in which either a thesis or a comprehensive examination is required.

Ph.D. Degree

The degree Doctor of Philosophy as granted at the University of California means that the recipient possesses knowledge of a broad field of learning and has given evidence of distinguished attainment in that field; it is a warrant of critical ability and powers of imagination and synthesis. It means, too, that the candidate has presented a dissertation containing an original contribution to the knowledge of the chosen field of study.

Students working toward a doctorate must be registered and in University residence for a minimum of six regular quarters. Experience indicates that it takes considerably

longer than this to complete a degree program. Two consecutive regular Summer Sessions may count as the equivalent of one regular quarter.

There is no University unit requirement for the doctoral degree. However, individual programs have course requirements which must be completed prior to your admission to the Qualifying Examination.

The Qualifying Examination is administered by a committee appointed by the Dean of the Graduate Division. The Examination is intended to demonstrate your critical ability, powers of imagination and synthesis, and broad knowledge of the field of study. Upon recommendation of the Qualifying Examination Committee, and with the approval of the Graduate Council, you may repeat the Examination one time.

After successful completion of the Qualifying Examination, you are advanced to Candidacy for the degree. At this time, a committee is appointed to direct you in your research problem and guide you in the preparation of the dissertation.

Normative Time to the Ph.D. Degree. The University of California has adopted a policy statement on the normative time in which students are expected to complete the requirements for the Ph.D. degree programs. This policy establishes the period of full-time registration in which a student entering a Ph.D. degree program with a bachelor's degree and without any stated deficiencies should be able to complete the requirements of a particular program. The normative time for Ph.D. programs at Davis is expressed in terms of academic years, each academic year being comprised of three quarters in full-time registered status. The normative time for completion of a Ph.D. program at Davis is usually four or five academic years.

Under the normative time policy, the University policy on continuous registration from the first quarter of enrollment to completion of degree requirements, unless on an approved leave of absence, will be strictly enforced. There is a financial incentive for completing the Ph.D. program within the normative time; students formally advanced to candidacy are currently eligible each quarter for a partial fee-offset grant until completion of the Ph.D. degree or until the cumulative time in graduate status at UCD exceeds the normative time to degree in a student's field of study.

PROGRAM OF STUDY

New students are assigned an adviser within the appropriate department or graduate group who assists them in planning a program of study. The program will depend to some degree on the student's undergraduate training, and may include undergraduate courses to remove deficiencies. Each student must satisfy the degree requirements as published in the *Graduate Announcement*. Additional requirements for study may be established by the department or group and approved by the Graduate Council. These requirements often include a core of required courses, but considerable flexibility is permitted to suit individual needs. Undergraduates at Davis who plan to pursue graduate study should consult with their major adviser early in their senior year to guarantee adequate preparation.

INTERCAMPUS EXCHANGE PROGRAM

As a graduate student registered on any campus of the University, you may become an Intercampus Exchange Student with the approval of your graduate adviser, the chairperson of the department or group in which you wish to study on the host campus, and the Dean of the Graduate Division on both the home and the host campuses.

Although as an Intercampus Exchange Student you have library, health service, and other student privileges on the host campus, you are considered a graduate student in residence on your home campus. The grades obtained in courses on the host campus are transferred to your home campus and entered on your official record.

Application forms may be obtained at the Office of the Dean of the Graduate Division and should be submitted six weeks prior to the beginning of the quarter in which you wish to participate in the program.

PART-TIME ENROLLMENT

Some advanced degree programs are available to qualified graduate students who for reasons of occupation, family responsibility, retirement, or health are not able to attend full time. Students with part-time status must meet the same standards of quality for admission and for continuation in a graduate program as other students. Applicants desiring part-time en-

rollment in an approved program should file a petition with the Graduate Division after admission has been granted. Continuing graduate students who wish to change status between full-time and part-time must file a petition with the Graduate Division. Fee reductions that apply to part-time students are found on page 35 of this catalog. Application forms are obtained at the Graduate Division Office. See page 4 for filing deadlines.

EMPLOYEE-STUDENT STATUS

Reduced fees are available to UC career employees and certain UC retirees who are qualified for admission to the University. Once admission has been granted, a petition for the reduction in fees must be filed prior to each quarter of enrollment. Employee students pay one-third of the regular fees and may enroll for up to nine units or three courses per quarter whichever is greater. Detailed information is in the UC Staff Personnel Policy Manual (Sections 260.23 for employees and 775.7 for retirees) available in department offices, at the Library Reference Center, or the Employee Relations and Development Office. Petitions can be obtained through the employee's unit.

FELLOWSHIPS, ASSISTANTSHIPS, AND LOANS

Fellowships are awarded by the Fellowship Committee of the Graduate Council on the basis of scholarship and promise of outstanding academic and professional contribution. Applicants who plan to enter in a Fall Quarter and wish to be considered for a fellowship or graduate scholarship must file the combined Application for Admission and Fellowship no later than January 15 preceding the Fall Quarter to be attended. These applications are considered only once a year. If you are continuing in graduate status at Davis you must file an application for fellowship and graduate scholarship for continuing students with the chairperson of your graduate program 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 program 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 and work-study for graduate students (see page 36).

TEACHER CREDENTIAL PROGRAM

The teacher education program at UC Davis is administered by the Graduate Division.

Acceptance into the *multiple-subject teaching credential (elementary) program*, either regular or bilingual emphasis (Spanish), does not require any specific campus major. If you are accepted to this program, you can meet the State requirements for a diversified major by completing a regular University major and one of the following alternatives:

- The additional requirements for the approved UC Davis Diversified Waiver Program;
- The additional requirements for the approved Mexican-American (Chicano) Studies Diversified Waiver Program; OR
- Achieving a passing score on the National Teachers Examination (Common Section).

California State *single-subject teaching majors (secondary)* for which Davis students can qualify are: agriculture, art, English (including drama and speech), foreign languages, government, history, home economics, life science, mathematics, music, physical education, physical science, and social science. For information concerning University majors and campus waiver programs which satisfy these single-subject majors, or State-approved examinations available to test competence in these single-subject majors, consult the appropriate adviser in the departments of Education or Applied Behavioral Sciences.

Admission to the teacher education program is by the Graduate Division. Eligibility requires a scholarship record of B (3.0). For the 1985-86 program, applications and filing deadlines should be obtained from the Departments of Education, 174 Kerr Hall or Applied Behavioral Sciences (home economics and agricultural education), 106 Academic Office Building-IV.

State legislation makes the teacher education program also available to upper-division students. With careful planning it is possible for some students to finish requirements for a non-renewable preliminary credential at the same time the bachelor's degree is completed. This credential allows you to teach for five years, but within that time you must complete an additional ("fifth") year of study for the clear credential. Specific requirements may be obtained from the Department of Education.

Students considering teaching as a career should consult the departments of Education or Applied Behavioral Sciences **as early as their freshman year.** Because of the complexity of the Teacher Preparation and Licensing Law and the requirements of Davis campus programs, students are encouraged to maintain close contact with education advisers throughout their undergraduate years.

Professional School Preparation

Professional School Preparation

REQUIREMENTS AND PREPARATION

Eligibility for admission to one of the University of California professional schools or curricula is contingent upon the successful completion of an undergraduate program of preprofessional training of 2 to 4 years, depending upon requirements for specific schools. Announcements and information describing admission and course requirements for a particular school are available by writing to the school of your choice in care of the appropriate University campus.

Legend and addresses:

(B) University of California, Berkeley 94720

(D) University of California, Davis 95616

(I) University of California, Irvine 92717

(LA) University of California, Los Angeles 90024

(R) University of California, Riverside 92502

(SD) University of California, San Diego, La Jolla 92093

(SF) University of California, San Francisco 94143

(SB) University of California, Santa Barbara 93106

(SC) University of California, Santa Cruz 95064

Direct inquiries about schools and curricula in San Francisco (except Hastings College of the Law) in care of: Office of Student Admission.

Professional schools and curricula requiring 2 to 3 years of undergraduate preparation:

School of Business Administration (B)
School of Criminology (B)
Curriculum in Cytotechnology (SF)
Curriculum in Dental Hygiene (SF)
Schools of Dentistry (LA, SF)
Curricula in Education (B, D, I, LA, R, SB, SC)
School of Engineering (I)
School of Engineering and Applied Science (LA)
School of Forestry and Conservation (B)
School of Journalism (B)
Curriculum in Medical Illustration (SF)
Curriculum in Medical Technology (SF)
Schools of Medicine (D, I, LA, SD, SF)
Schools of Nursing (LA, SF)
School of Optometry (B)
School of Pharmacy (SF)
Curriculum in Physical Therapy (SF)
Schools of Public Health (LA, B)
School of Veterinary Medicine (D)

Professional schools requiring a bachelor's degree in appropriate field of study for admission:

Graduate Schools of Administration (D, I, R)
School of Architecture and Urban Planning (LA)
Graduate School of Business Administration (B)
Schools (or Departments) of Education (B, D, I, LA, R, SB, SC)
Preparation for teaching credentials is available as follows:
Elementary Teaching (B, D, I, LA, R, SB, SC, SD)
Bilingual (Cantonese) Emphasis—Elementary (B, LA)
Bilingual (Spanish) Emphasis—Elementary (B, D, I, R, SB, SC, SD)
Secondary Teaching (B, D, I, LA, R, SB, SC)
Bilingual (Cantonese) Emphasis—Secondary (LA)
Bilingual (Spanish) Emphasis—Secondary (I, LA)
Special Education (I, R, SB)
Pupil Personnel Services: Basic (Counseling) (B, I, LA, R, SB)
Agricultural Specialist (D)
Bilingual (Spanish) Specialist (D, I, LA, SB)
Reading Specialist (B, D, LA, R, SB)
School Librarianship (B, LA)
School Psychology (B, D, I, LA, SB)
Clinical-Rehabilitative Services (SB)
Administrative (B, I, LA, R, SB)
Health Services (SF)
Early Childhood Specialist (I, SB)
Administration (B, LA)
Graduate School of Journalism (B)
Schools of Law (B, D, LA)
Hastings College of the Law (SF)
School of Librarianship (B)
School of Library and Information Science (LA)
Graduate School of Management (LA)
Graduate School of Public Policy (B)
Schools of Public Health (LA, B)
Schools of Social Welfare (B, LA)
Scripps Institution of Oceanography (SD)

PREPROFESSIONAL TRAINING

Preprofessional programs do not—in and of themselves—lead to a bachelor's degree. Since professional schools cannot accommodate all qualified applicants, students should prepare themselves for alternate careers and are expected to pursue a major program while completing their preprofessional requirements.

With careful planning it is possible for students to undertake any one of a variety of majors. While most students interested in the health sciences will elect a major within the biological sciences, majors as varied as psychology, engineering, and art can be equally acceptable. Law schools, in particular, do not prescribe any specific major program. They give equal consideration to all qualified applicants completing a course of study which gives them a broad cultural background and includes intensive work for a substantial period of time in a selected field of study.

REFERRAL INFORMATION

Although the Davis campus offers course work in preparation for admission to most of the schools listed above, the referral information which follows relates to the types of preprofessional training in greatest demand at Davis.

Students are strongly urged to read this catalog and the appropriate professional school announcement carefully before consulting faculty and staff about admission requirements. Communicate directly with personnel at the professional school to which you expect to apply if you need more detailed information. A list of general reference books which may be of interest is presented at the conclusion of this section.

ADMINISTRATION

The UC Davis **Graduate School of Administration,** which enrolls its fourth class in the fall of 1984, offers a two-year program of study in management and policy analysis leading to the Master of Administration degree. (See page 106 for details.)

BUSINESS ADMINISTRATION AND PUBLIC POLICY

Preparation for study: See published announcements of schools of business administration and public policy. For advice and counsel, see the departmental advisers in the Department of Economics (380 Kerr Hall, 752-0741) or Agricultural Economics (118 Voorhies Hall, 752-1517); or see the Pre-Business School (Peer) Adviser located in 359 Kerr Hall, 752-6512.

FORESTRY

Preparation for Study: Consult this catalog (pages 69, 184, 302) and the announcement of the Department of Forestry and Conservation, UC Berkeley.

Preforestry advisers: C.C. Delwiche (Land, Air and Water Resources, 273 Hoagland Hall, 752-1511 or 752-1409).

LAW

Preparation for study: Consult this catalog (page 108), school announcements, and the annual *Pre-law 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 law school preparation should consult the Pre-Law Adviser, Pre-Law Advising Office, 109 South Hall, 752-3009. Information is available about law school admission procedures, academic program planning (see also page 26), and professional possibilities.

School of Law, UC Davis: Consult this catalog (page 108), the catalog of the School of Law, or the Law School Admissions Office, 115 King Hall, 752-6477.

HEALTH SCIENCES

At the Davis campus only preparatory work is offered. Professional training for all fields except medicine, nurse practitioning, physician assisting, and veterinary medicine must be completed elsewhere. Degree work is offered at Davis for dietetics, but students must apply elsewhere for the required postgraduate internship. Information regarding careers in dietetics or nutrition can be obtained from the Nutrition Department or the Work-Learn and Career Planning and Placement Office on campus. Contact the Health Sciences Advising Office, (South Hall, 752-2672) regarding curricula and schools for all health science fields.

Suggested Curricula. Since specific school requirements vary, students should either contact the schools directly, or contact the Health Sciences Advising Office for more detailed information. Students transferring into a professional program offered at the undergraduate level must complete that school's general education requirements.

Students are advised that in California most professional programs are unable to accommodate all applicants. Students may wish to consider applying also to out-of-state programs. Professional school admissions committees evaluate applicants on the basis of their course work and grades, test scores, work experience in health care, community activities, and letters of recommendation.

Courses listed under each of the following health fields of study are *general requirements only.*

Clinical Laboratory Technology

To qualify for the required twelve-month medical technology traineeship in California, students need to complete a baccalaureate degree, which includes the following minimum coursework requirements as specified by the State Department of Health.

Biological sciences: 27 units, including instruction in hematology (Clinical Pathology 101), immunology (Veterinary Microbiology 126 or Medical Microbiology 107), and medical microbiology (Veterinary Microbiology 127).
Chemistry: 24 units, including Chemistry 1A, 1B, 1C, 5 and Biochemistry 101A-101B or Physiological Sciences 101A-101B.
Physics 2A, 2B, 2C.
Mathematics or calculus, at least one term.
Strongly recommended courses include: hematology (Clinical Pathology 101L); immunology (Veterinary Microbiology 126L); parasitology (Veterinary Microbiology 132, Medical Microbiology 215, or Entomology 156-156L); and a laboratory in clinical chemistry (e.g., Clinical Pathology 102 or Biochemistry 101L).
Recommended courses include: organic chemistry (Chemistry 8A-8B); physics (Physics 3A-3B-3C); Physiology 110-110L; virology (Veterinary Microbiology 128 or Biological Sciences 162); histology (Zoology 122).
Suggested electives:
Genetics (Genetics 100A-100B or 120); Human Anatomy 101; advanced immunology (Veterinary Microbiology 270); computer programming (Engineering 5, Computer Science Engineering 8, or 20); business management (Agricultural Economics 112).

Requirements vary among training programs. Students should check the individual program for additional required courses.

Dentistry

Students complete three to four years of preprofessional course work prior to admission to the three- or four-year dental curriculum. The Dental Admission Test should be taken in April or October—one year prior to the projected date of admission, but preferably in April. Check individual catalogs for exact prerequisites.

Biological sciences (at least one year with laboratory). Recommended: Biological Sciences 1; Zoology 2-2L; Physiology 110-110L; Zoology 100-100L; Biochemistry 101A-101B.

"Many people mistakenly think that you have to major in a science to get into medical school, but it's good to know that, as long as you take all the required classes for admission, you can major in anything that interests you."

- Senior, Spanish

Chemistry 1A-1B-1C, and at least 8 units of organic chemistry with laboratory (e.g., either courses 8A-8B, 128A-129A, or courses 128A-128B-128C and 129A-129B-129C). Check individual catalogs for specific requirements.
English: one year, preferably to include two composition courses (e.g., English 1, 3, 103). Rhetoric courses are not acceptable.
Physics 2A-2B-2C and 3A-3B-3C.
Psychology: one lower- and one upper-division course. Recommended: Psychology 1, 16, 112, 145, or 168.
Suggested electives: Statistics 13 or Human Anatomy 101, 101L; Mathematics 16A-16B-16C; Genetics 100A-100B; sculpture course, art practice.

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. Entrance requirements vary greatly from program to program. Contact the school of your choice for particular requirements. Elective courses may be selected from the following:

Agricultural Economics (e.g., courses 18, 112, 117, 171A, 171B).
Applied Behavioral Sciences (e.g., courses 151, 152, 153, 154, 155, 160A, 160B, 162, 163, 164).
Biological Sciences 1.
Community Health 101, 121, 204.
Economics (courses 1A, 1B, 11A, 11B, 131, 134, 150A, 151A).
Engineering 5.
Epidemiology and Preventive Medicine 401, 402, 403, 404.
Food Service Management 123.
History (e.g., courses 174A, 174B, 174C, 174D, 185B).
Statistics 13 or Agricultural Science and Management 150; Computer Science Engineering 20.
Political Science (e.g., courses 100, 101, 102, 156, 180, 181, 182, 183, 187, 188).
Psychology 1, 112, 145, 168.
Rhetoric 1, 3.
Sociology (e.g., courses 154, 180A, 180B).

Medicine

Students complete three to four years of preprofessional course work prior to admission to medical school. The Medical College Admission Test must be taken at least one year prior to expected date of admission. Check individual medical college catalogs or contact the Health Sciences Advising Office, South Hall, for specific requirements for each school. Any major is appropriate for admission; the following courses are required by most schools.

Biological sciences: six quarters, with laboratory. (Biological Sciences 1, Zoology 2-2L, Physiology 110, 110L, Bacteriology 2 or 102, and 3 recommended).
Chemistry 1A-1B-1C; one year organic, with laboratory (e.g., Chemistry 128A-128B-128C and 129A-129B-129C).
Physics: one year, with laboratory (e.g., 2A-2B-2C, 3A-3B-3C).
English: one year (e.g., English 1, 3, 103).
Mathematics: one year of calculus (e.g., Mathematics 16A-16B-16C).

Nursing

Two years are usually required to complete prerequisites prior to transferring into two- or three-year baccalaureate nursing programs. General requirements include:

Bacteriology 2 or 102, and 3.
Chemistry 1A, 1B, 8A, 8B.
English 1.
Human Anatomy 101, 101L.
Physiology. Recommended: Physiology 2-2L or 110-110L.
Psychology 1.
Sociology 1.
Recommended courses include: Nutrition 10 or 101 or 110; Human Development 100A or Psychology 112; Anthropology 2; Rhetoric 1 or 3; Physics 3A, 10; Zoology 2, 2L; Family Practice 92A-H, 192K; Community Health 101; Biological Sciences 19, Psychology 15 or 108.

Specific requirements vary from school to school and are subject to change; students are advised to contact specific schools regarding requirements. An R.N. license may also be earned through Associate degree programs (A.D.N.) offered by community colleges or through hospital diploma programs.

Occupational Therapy

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

Biological Sciences 1.
Chemistry 1A, 1B.
English 1 or 3.
Human Anatomy 101, 101L.
Human Development 100A-100B or Psychology 112.
Physiology 2-2L or 110-110L (110-110L recommended).
Psychology 1, 168.
Sociology: one course or Anthropology 2.
Suggested electives: Human Development 100C, 102, 130, 131, 141; additional psychology; Physics 2A-2B-2C, 3A-3B-3C, 10; Physiology 111A-111B, 112-113; Community Health 101; Genetics 10; Nutrition 10; art and design courses; Physical Education 103, 105, 113, 125, 131; Family Practice 92A-H, 192K; Rhetoric 1, 3; Bacteriology 2, 3. CSU San Jose requires a "skills" course.

Optometry

Two years minimum preparation is required prior to transfer into a four-year Doctor of Optometry degree curriculum. Students must take the Optometry College Admission Test, one year prior to projected date of admission. Inquire at the Health Sciences Advising Office for test dates. Check individual catalogs for exact prerequisites.

Biological sciences (one year with laboratory). Recommended: Biological Sciences 1; Bacteriology 2 or 102 and 3; Zoology 2-2L; Human Anatomy 101-101L; Physiology 110-110L.
Chemistry: one year of general (Chemistry 1A, 1B, 1C) and one year of organic with laboratory, (8A, 8B and 128A-129A or 128A-128B-128C and 129A-129B-129C). Required by a few schools: 9 units of organic chemistry.
English: one year (e.g. English 1, 3, 103). Rhetoric courses may fulfill this requirement.
Mathematics 16A-16B. Required by some schools: Mathematics 16C; Statistics 13 or Agricultural Science and Management 150.
Physics 2A-2B-2C, 3A-3B-3C.
Psychology: two courses, Psychology 1 and one upper division course (e.g., Psychology 112, 168).
Suggested electives: economics, sociology, biochemistry, additional biological sciences.

Pharmacy

One to two years minimum preprofessional course work is required prior to transfer to professional training. Students may be required to take the Pharmacy College Admission Test one year prior to projected date of admission. Each school has its own requirements; experience in the field is highly recommended. Check individual catalogs.

Biological sciences (one year with laboratory). Recommended: Zoology 2-2L, 100; Bacteriology 2 or 102, 3; Biological Sciences 1.
Chemistry: one year of inorganic chemistry with laboratory (Chemistry 1A-1B-1C); one year of organic with laboratory (Chemistry 128A-128B-128C-129A-129B-129C). UCSF requires Chemistry 5, but no organic chemistry. UOP B.S. degree program does not require organic chemistry.
Economics. USC requires one macroeconomics course (Economics 1B). A few schools require Economics 1A-1B.
English, one year: one each of composition, literature and one other.
Mathematics 16A-16B (-16C required by out-of-state schools) and Statistics 13.
Physics: one year physics with laboratory (Physics 2A-2B-2C, 3A-3B-3C).
Psychology: one course, such as Psychology 1.
Rhetoric 1 or 10.
Suggested electives: courses in behavioral psychology, speech, communication, sociology, anthropology, history, and political science.

Physical Therapy

Basic preprofessional training is available for both the undergraduate and graduate levels; students must obtain professional training from another school. Each physical therapy program has its own specific requirements; therefore, students should contact the school of their choice. Experience in the field is strongly recommended. General requirements include:

Biological Sciences 1.
Chemistry: 1A, 1B. Recommended: 1C, 8A, 8B.
English 1.
Human Anatomy 101, 101L.
Physics 2A, 3A. Many schools require also Physics 2B, 2C, 3B, 3C.
Physiology 110-110L (required by majority of schools).
Psychology 1 and 168.
Statistics 13.
Suggested electives: Human Development 100A-100B or Psychology 112; Human Development 100C, 131, 141; Bacteriology 2 and 3; Sociology 1, 3; Zoology 2-2L, 106, 143; Anatomy 215; Physical Education 101, 102, 103, 105, 113, 125, 131; Rhetoric 1, 3; Community Health 101; Family Practice 192K; additional psychology.

Physician Assisting

Physician Assistant programs often require courses in English composition, sociology, psychology, chemistry, anatomy, physiology, bacteriology, and mathematics. Additionally, one to two years of direct patient care (i.e., nurse, nurses aide, EMT, orderly, corpsman) are usually required. The majority of the programs are for training people who are interested in assisting the primary care physician in underserved areas; however, specialty training is available. Physician's assistants work in a wide variety of settings.

Speech Therapy

Students must transfer to another school for preprofessional and professional training through a master's degree or special teaching credential program.

Speech therapy and audiology programs are highly specific in their entrance requirements at both the undergraduate and graduate levels. UC Davis offers courses that satisfy a few of the requirements, however it has no preprofessional major for these fields. For information on courses at Davis which are acceptable toward specific programs in speech therapy and audiology, you may contact either the Health Sciences Advising Office or the professional program in which you are interested.

School of Medicine, UC Davis: Consult page 112 of this catalog, the *School of Medicine Bulletin,* or the Office of Student Affairs, School of Medicine, 752-3170.

School of Veterinary Medicine, UC Davis: Consult this catalog page 116, the *Announcement of the School of Veterinary Medicine,* or the Office of Student Services, School of Veterinary Medicine, 752-1383.

REFERENCE BOOKS

School catalogs and reference texts are available in the Periodicals Room of the Shields Library, the Health Sciences Library, or the Health Sciences Advising Office.

Some recommended publications are as follows:

American Universities and Colleges, edited by the American Council on Education.

Graduate Programs and Admissions Manual, published by the Graduate Record Examination Board and the Council of Graduate Schools in the United States.

Admission Requirements of American Dental Schools, published by the American Association of Dental Schools.

Medical School Admission Requirements U.S. and Canada, published annually by the Association of American Medical Colleges.

Pharmacy School Admission Requirements, published annually by the American Association of Colleges of Pharmacy.

School of Administration

Graduate School of Administration

Information:
Graduate School of Administration
390 Voorhies Hall
752-7399

PREPARATION FOR THE STUDY OF ADMINISTRATION

A bachelor's degree and a strong interest in professional management are prerequisites for admission to the Graduate School of Administration. The school seeks students from diverse professional and academic backgrounds, and does not limit its consideration to applicants from any particular category of majors. Although the program has no specific subject prerequisites, it is strongly recommended that students complete the following coursework prior to enrollment in the program:

Economics—the introductory courses in micro and macroeconomics, and one upper-division course in microeconomics (Economics 1A, 1B, 100).

Mathematics—an introductory course in calculus (Mathematics 16A).

Statistics—one course in elementary statistics (Statistics 13).

Well-developed English reading and writing skills are essential for success in the program.

ADMISSION

Admission is for the Fall Quarter only. Application materials may be obtained from the Graduate School of Administration and must be completed and returned, along with a nonrefundable application fee of $35 and all supporting documents, by April 1. Completed applications for fellowship and graduate scholarships must be filed by January 15.

Applications are reviewed by the Admissions Committee which seeks students of clear promise and ability as evidenced by undergraduate grade-point average, GMAT scores, letters of recommendation and a personal statement. Professional management experience is not required for admission, but is favorably considered.

The Graduate School of Administration of the University of California, Davis, prepares men and women for management careers in business, government, and nonprofit enterprise. The School combines the principal components of leading graduate programs of business management and public policy analysis into an intensive two-year course of study leading to the Master of Administration degree. The Graduate School of Administration admitted its charter class in the fall of 1981, and the planned enrollment at maturity is 300.

The two-year program provides both entry-level and mid-career students with an understanding of management approaches to problem solving and an awareness of the environment within which public and private management decisions are made. Successful completion requires not only a sophisticated understanding of a variety of functional skills in finance, marketing, production, program evaluation and accounting; but also an understanding of computers, information systems and the application of scientific methods to the identification and solution of management problems.

The program has a first-year core which emphasizes concepts and techniques appropriate to management in either the public or private sector so that students, no matter what their special career interests, are prepared to function in either sphere. Courses in the core cover economic analysis, policy analysis, quantitative methods, accounting, budget and control, marketing and finance, organizational theory, and law. During the second year, students specialize in one of several concentrations including General Management, Management Science, Management Information Systems, Accounting and Finance, Agricultural Management, Environmental and Natural Resource Management, and Science and Engineering Management, each with an emphasis in either the public or private sector. Joint degrees in Engineering and Management and Law and Management are also offered.

An internship during the summer after the first year and a problem-oriented second-year seminar give the student contact with real management problems in which concepts and methods learned in the first year can be applied.

School of Law

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 1984 will see the School enroll its nineteenth class.

The program of the School is designed to combine the best features of traditional legal education with the development of new interests and approaches necessary for training lawyers to meet the demands of the future. In addition to the traditional professional curriculum, the School offers opportunities for practical experience through clinical programs and for in-depth study of an area of law in an individualized program of classroom work, research, writing, and experience in the community. It also seeks to promote critical evaluation of law and legal institutions in a broad perspective, integrating non-legal disciplines with professional legal education.

The School is fully accredited by the American Bar Association, is a member of the Association of American Law Schools, and has a chapter of the Order of the Coif.

Preparation for the Study of Law

No specific college major is required for admission to the School of Law, and there is no prescribed pre-legal program. Your college record and Law School Admission Test (LSAT) score must, of course, demonstrate that you are highly qualified for the study of law.

As a pre-law student, you should plan a course of study that will give you a broad cultural background and include intensive work for a substantial period of time in a selected field of study. Pre-law students should develop the ability to communicate easily, persuasively, and accurately; to understand people and institutions; to gather and weigh facts; and to solve problems and think creatively. You should be able to read rapidly with comprehension, and express yourself clearly, completely, and concisely, both orally and in writing—in short, it is most important that you obtain mastery of the English language.

Assistance in program planning may be obtained from the Pre-Law Advising Office, South Hall, 752-3009 (see pages 26 and 101).

For additional information, see the official *Pre-Law Handbook,* published annually and prepared by the Law School Admission Council and the Association of American Law Schools. This book includes material on the law and lawyers, pre-law preparation, applying to law school, and the study of law, together with individualized information on most American law schools. It may be found at college bookstores or ordered from Law School Admissions Services, Box 2000, Newtown, PA 18940.

ADMISSION

Requirements for Admission

Your application for admission to the School of Law's professional curriculum must show a record of sufficiently high caliber to demonstrate qualification for the study of law. A bachelor's degree or an equivalent degree from an approved college or university must be earned prior to the time you begin work in the School.

Your application will be reviewed by the School of Law Admissions Committee, which seeks students of demonstrated academic ability, as evidenced by LSAT scores and the undergraduate grade-point average (GPA). The Committee seeks students of diverse backgrounds. In this regard, the Committee considers ethnic and economic factors, advanced degrees or other advanced studies, significant work experience, and extracurricular and community activities during and after the college years. An applicant's growth, maturity, and commitment to the study of law are major concerns.

Students are admitted only on a full-time basis and *only in August.*

Law School Admission Test (LSAT)

All applicants are required to take the Law School Admission Test administered by the Law School Admission Services. Testing centers have been established for the convenience of applicants in all parts of the United States and in many foreign countries. Tests are given four times a year: March, June, September, and December. If at all possible, you should take the test by September, 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 ensure the applicant's being registered.

To obtain application forms, information about the test, specific test dates, and the location of testing centers, write to: Law School Admission Test, Law School Admission Services, Box 2000, Newtown, PA 18940.

Admission Procedures

Complete details of admission procedures are included in the *Law School Catalog.*

1. Application for admission to the School of Law and to the Graduate Division of the University for the program leading to the degree of Juris Doctor should be made on forms supplied by the School. Application forms and the School catalog may be requested from the Office of Admissions, School of Law, University of California, Davis, CA 95616. *The completed application must be returned to that same office, accompanied by a $35 nonrefundable application fee* in the form of a check or money order made payable to The Regents of the University of California.

The last date for filing completed application forms, together with all supporting documents, including LSAT scores, Law School Data Assembly Service (LSDAS) reports, and letters of recommendation, is *February 1* of the year in which admission is sought. Early filing of all application materials is strongly recommended and will materially assist the School of Law Admissions Committee in its considerations.

2. You must take the Law School Admission Test and submit the Law School Application Matching Form with your application so that the score will be reported to

the School. You are urged to take the test as early as possible, and in no event later than December preceding the year in which admission is sought.

3. You should register with the LSDAS no later than December 1 by completing and mailing the registration form supplied with each LSAT information packet. A transcript from each college or university attended must be sent directly to the Law School Data Assembly Service, Law School Admission Services, Box 2000, Newtown, PA 18940.

4. An official transcript of college work completed during the first semester or quarter of your senior year *must* be submitted directly to the School of Law *as soon as* it is available. Failure to do so may delay consideration of your application materials. Successful applicants are required to submit directly to the School of Law a final transcript showing the award of a bachelor's degree.

5. Two letters of recommendation from objective and responsible persons to whom you are well known must be provided. At least one of these letters should come from a faculty member under whom you studied while in college. These letters of recommendation should come directly from the writer or from a college placement center, career center, or college pre-law office. The Admissions Committee cannot seriously consider your application before two letters have been received.

6. When accepted by the School of Law, you are simultaneously admitted to the Graduate Division on the Davis campus of the University for the program leading to the degree of Juris Doctor. If you intend to pursue studies leading to other graduate degrees, or wish to become a candidate for a Combined Degree Program (see page 110), you must make separate application to the Graduate Division prior to commencing such studies.

Admission to Advanced Standing

If you have completed at least one year of work in another approved law school, you may be considered for admission to advanced standing with credit for not more than one year of such work. No application for advanced standing will be considered until the Office of Admissions has received transcripts for all prior law school work.

Application procedures for advanced standing are the same as described above with the addition of (1) a letter of good standing including class rank from the dean of any law school previously attended; (2) at least one letter of recommendation from a law professor; (3) transcripts of all law school work; (4) LSAT score (no need to register with LSDAS—a copy of the report previously submitted to the school you are presently attending will suffice); and (5) an official transcript from the school where you earned your undergraduate degree, stating the date the degree was conferred. The deadline for transfer applications is *June 30* of the year for which transfer is sought. Committee decisions on advanced standing are normally made in late July or early August of the year *in* which admission is sought.

Students who have been disqualified at another law school will not be admitted to this school.

Minority Recruitment

The students and faculty of the UCD School of Law recognize the need for minority lawyers. The School, therefore, actively solicits applications from Asian, Black, Chicano, Native American, Pilipino, and other minority students. Although 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 confront this country—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 Special Scholarship Program in Law, American Indians, P.O. Box 4456, Station A, Albuquerque, NM 87196.

The Mexican-American Legal Defense and Education Fund (MALDEF) has monies available for Chicano students who have applied to law school. Applications may be obtained by writing to: Mexican-American Legal Defense and Education Fund, 28 Geary Street, 6th Floor, San Francisco, CA 94108.

PROFESSIONAL CURRICULUM AND DEGREE

The course of study in the professional curriculum requires six semesters for completion and extends over a period of three years. It is designed for full-time students only; no part-time or evening program is offered. New students are admitted only at the beginning of the Fall Semester.

When you satisfactorily complete the professional curriculum of 84 semester units, and the required period of resident study, you will be recommended for the degree of Juris Doctor.

The first year's work is prescribed and provides the essential foundation for subsequent legal study. Satisfactory completion of the first-year courses is, in all cases, 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 240.

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 four years. You will usually be able to earn up to 10 semester-hours of law school credit for work in the related discipline and normally can complete the combined degrees in less time than it would take to earn the two degrees separately. The first year of the Combined Degree Program must be taken entirely in the School of Law. During the remaining years, 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.

Students have pursued degree programs 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 administration, economics, and sociology. The Law School will attempt to work out an additional program if you are interested in other disciplines. You may enroll in the Combined Degree Program any time prior to the beginning of your third year in law school. If you are interested in pursuing a Combined Degree Program, and have made a separate application to another school or department, you should indicate this on the School of Law admission form.

SEMESTER SYSTEM

The School of Law operates on a semester system rather than the quarter system used on the remainder of the Davis campus.

Academic Calendar 1984-85

	Fall 1984	Spring 1985
First-year Introductory Program begins	Mon, Aug 20	
Law School instruction begins	Mon, Aug 27	Mon, Jan 14
Labor Day holiday*	Mon, Sept 3	
Thanksgiving holiday period*	Thurs-Fri, Nov 22-23	
Martin Luther King, Jr. holiday*		Mon, Jan 21
President's holiday*		Mon, Feb 18
Spring vacation period		Mon-Fri, Apr 1-5
Law School instruction ends	Fri, Dec 7	Fri, May 3
Reading period	Sat-Tues, Dec 8-11	Sat-Wed, May 4-8
Law school examination period	Wed-Sat, Dec 12-22	Thurs-Fri, May 9-24
Last day of semester	Sat, Dec 22	Fri, May 24
Law School Commencement		Sat, May 25

*Academic and administrative holiday.

APPLICATION MATERIALS

The catalog of the School of Law and application materials may be obtained by writing to the Office of Admissions, School of Law, 115 King Hall, University of California, Davis, CA 95616.

School of Medicine

Information:
School of Medicine
752-2717

The Doctor of Medicine degree requires the satisfactory completion of a four-year course of study comprised of 15 consecutive quarters. Course work is conducted on the Davis campus, at the University of California, Davis, Medical Center, Sacramento, and in nearby affiliated hospitals.

With the start of the academic term in June 1977, the Medical Sciences-I (MS-I) Complex opened. The new MS-1 Complex provides two lecture halls (each with a capacity of 170), smaller conference rooms, the Health Sciences Library, the Health Sciences Bookstore, and student lounges. A four-story, 200,000-square-foot structure is primarily devoted to multidisciplinary laboratories and faculty offices.

ADMISSION POLICIES

The class entering in the fall of 1984 will be limited to 93 students selected on the basis of academic achievement and promise, as well as personal characteristics that lead the Admissions Committee to feel the candidates will be able to complete satisfactorily the requirements of the medical curriculum and become excellent medical practitioners. Factors taken into consideration include scholastic records, Medical College Admission Test performance, and reports of teachers, advisers, and interviewers with regard to intellectual capacity, motivation, emotional stability, and personal dedication.

The vast majority of openings in the entering class will be awarded to students who are legal residents of the State of California. However, a few out-of-state students may be accepted. The School of Medicine also participates in the program of the Western Interstate Commission for Higher Education (WICHE). In this program are several states which do not offer professional graduate medical education. Applicants from such states found eligible by both the School of Medicine and their own states are charged resident rather than nonresident tuition. Further information may be obtained by communicating with this Commission at Post Office Drawer P, Boulder, CO 80302.

Applicant Selection. The School of Medicine selects students for admission with a view to meeting the needs of society, of the medical profession, and of the School. Because we live in a pluralistic society, and the educational experience is enhanced by the interaction of students from various backgrounds, the School desires diversity in its student body. This is reflected in the School's commitment to expand opportunities in medical education for individuals from groups underrepresented in medicine as the result of societal discrimination and to increase the number of physicians practicing in underserved areas. Therefore, the Admissions Committee, which is composed of individuals from a variety of cultural backgrounds and which is representative of a broad spectrum of medical sciences, evaluates applicants in terms of all relevant factors. These include academic credentials, with due regard to how they may have been affected by disadvantages experienced by the applicant, such personal traits as character and motivation, experience in the health sciences and/or the community, career objectives, and the ability of the individual to make a positive contribution to society, the profession, and the School.

Application Procedures

The School of Medicine participates in the centralized American Medical College Application Service (AMCAS). Application request forms are available from the School's Admissions Office after March 15 of each year. You may also secure this form from other AMCAS-participating medical schools or from your premedical adviser. You need to submit only one application and one set of official transcripts to AMCAS, regardless of the number of member schools to which you are applying.

Upon receipt of the application request form, AMCAS will send you an application for admission, together with descriptive material and instructions. The completed application and other required credentials should be submitted directly to AMCAS for verification, reproduction, and immediate distribution to the medical schools you have indicated.

After your AMCAS application has been received by the School of Medicine, the Admissions Office will notify you and may request two letters of recommendation along with a nonrefundable application fee of $35. These items should be sent directly to the Chairperson of the Admissions Committee, School of Medicine, University of California, Davis, CA 95616, and not to AMCAS. Recommendations can be in the form of a report by a premedical advisory committee at the college or university where you are enrolled or letters from two faculty members who are familiar enough with you and your abilities to make a meaningful evaluation. It is required that one letter be from a science instructor and the other from a non-science instructor.

Applications will be accepted by the Admissions Committee between *June 15* and *November 1*. It is strongly recommended that you make an early request for application materials from AMCAS and see that the necessary supporting items reach the Committee as soon as possible after the School of Medicine notifies you of receipt of your completed application from AMCAS. The Committee reviews only complete application files and schedules interviews for highly qualified applicants throughout the application period and beyond.

A personal interview is required before a place in the first-year class can be offered. However, because of the large number of applicants, it is not possible to interview each one, and for this reason interviews are held only at the invitation of the Admissions Committee. It is highly desirable that interviews take place at the medical school in order to provide you with first-hand knowledge of programs and facilities and give you the opportunity to meet some of the students. Where circumstances warrant, interviews may be arranged by the Admissions Committee at other locations.

You will be notified of your status as soon as possible after a decision has been reached. As decisions are made, letters of acceptance are sent; this can be as early as mid-October and as late as September of the following year.

Transfer with Advanced Standing

Students may be admitted by action of the Admissions Committee at levels more advanced than the regular entering level but not beyond the beginning of the third year. Such applicants must meet the entrance requirements for regular status in the School of Medicine, must satisfactorily complete courses elsewhere that are substantially equivalent to those offered in the School of Medicine, and must meet the necessary requirements for the advanced status requested. Applicants may also be required to pass examinations to establish their qualifications for admission. An advanced standing applicant must be a student in good standing at an approved medical school. At UCD the second-year classes begin work in early August and third-year classes begin work in early July. Applications for admission to advanced standing will be accepted until *January 1* of the year in which admission is sought.

Premedical Requirements

Arrangements for taking the New Medical College Admission Test should be made at the institution at which you are presently enrolled, and the Examining Board should be requested to forward the results to the Chairperson of the Admissions Committee, UC Davis School of Medicine. Information about the test can be obtained at your undergraduate college or directly from MCAT Registration, Box 414, Iowa City, IA 52240. It is desirable that the results of the test be available at the time your qualifications are reviewed. The Admissions Committee recommends that, if feasible, tests be taken in the spring prior to application.

Applicants for admission to the professional curriculum must have satisfactorily completed a minimum of three years (90 semester units; 135 quarter units) of college-level work in an accredited school. In most instances, however, completion of a four-year course of study leading to a bachelor's degree is recommended.

Although a specific major in science is not necessary, the following course content at college level is required:

a. English, one year or the equivalent

b. Biological science, one year (including laboratory) or the equivalent

c. General chemistry, one year (including laboratory) or the equivalent

d. Organic chemistry, one year or the equivalent (If two or more undergraduate organic courses are offered, it is recommended that you elect the more rigorous option.)

e. Physics, one year or the equivalent

f. Mathematics, course work to satisfy prerequisites for integral calculus

Upon matriculation, each applicant must have both an overall grade-point average and science grade-point average of at least 3.0 (on a scale where one credit hour of A = 4 points). Grades of D in any of the required courses cannot be accepted. Required courses may not be taken on a Passed/Not Passed basis unless all courses at your undergraduate institution are graded this way.

While the minimal overall and science GPA requirements at the UCD School of Medicine have been established at 3.0, in exceptional cases a special waiver may be granted by the Faculty of the School of Medicine through the action of the Executive Committee and at the recommendation of the Chairperson of the Admissions Committee.

Applications may be submitted on the basis of work completed plus work in progress. However, all academic requirements must be completed by June 30 of the year for which admission is sought.

Although the minimum scholastic requirements are stated in some detail, it should not be inferred that admission is assured each applicant who meets these requirements. In addition to a high level of academic competence, many other factors which determine success in pursuing a career in medicine are given full weight by the Admissions Committee before it reaches a final decision.

For additional information, contact the School of Medicine Admissions Office or request the *School of Medicine Bulletin* from the medical school Admissions Office.

"With the vet hospital and the UCD Medical Center in Sacramento, the opportunities for research and clinical internships are staggering."

- Junior, Psychology

Academic Calendar 1984-85

The School of Medicine operates on a different schedule from the remainder of the campus.

SUMMER QUARTER 1984	
Medical School **instruction begins** for 3rd- and 4th-year students	**Mon, July 2**
Medical School **instruction begins** for 2nd-year students	**Mon, July 30**
National Board Examination: Part I	**Wed-Thurs, Sept 5-6**
Medical School **instruction ends** for 2nd-year students	**Mon, Sept 10**
Final Examination period for 2nd-year students	**Tues-Fri, Sept 11-14**
Medical School **instruction ends** for 3rd- and 4th-year students	**Fri, Sept 21**
Academic and administrative **holidays**	**July 4** **Sept 3**
FALL QUARTER 1984	
Medical School **instruction begins** for 3rd- and 4th-year students	**Mon, Sept 24**
Orientation period for incoming students	**Mon-Wed, Sept 24-26**
National Board Examination: Part II	**Tues-Wed, Sept 25-26**
Medical School **instruction begins** for 1st- and 2nd-year students	**Thurs, Sept 27**
Medical School **instruction ends** for 1st- and 2nd-year students	**Fri, Dec 7**
Final Examination period for 1st- and 2nd-year students	**Mon-Fri, Dec 10-14**
Medical School **instruction ends** for 3rd- and 4th-year students	**Fri, Dec 14**
Academic and administrative **holidays**	**Nov 22-23** **Dec 24-25** **Dec 31-Jan 1**
WINTER QUARTER 1985	
Medical School **instruction begins** for 2nd-, 3rd-, and 4th-year students	**Wed, Jan 2**
Medical School **instruction begins** for 1st-year students	**Mon, Jan 7**
Medical School **instruction ends** for 2nd-year students	**Tues, Mar 12**
Final Examination period for 2nd-year students	**Wed-Tues, Mar 13-19**
Medical School **instruction ends** for 1st-year students	**Fri, Mar 15**
Final Examination period for 1st-year students	**Mon-Fri, Mar 18-22**
Medical School **instruction ends** for 3rd- and 4th-year students	**Fri, Mar 22**
Academic and administrative **holidays**	**Jan 21** **Feb 18** **Mar 25**
SPRING QUARTER 1985	
Medical School **instruction begins** for 2nd-, 3rd- and 4th-year students	**Tues, Mar 26**
Medical School **instruction begins** for 1st-year students	**Mon, Apr 1**
National Board Examination: Part II	**Tues-Wed, Apr 2-3**
Medical School **instruction ends** for 2nd-year students	**Fri, May 24**
Final Examination period for 2nd-year students	**Tues-Fri, May 28-31**
Commencement	**Fri, June 7**
Medical School **instruction ends** for 1st-year students	**Mon, June 10**
National Board Examination: Part I	**Tues-Wed, June 11-12**
Final Examination period for 1st-year students	**Wed-Tues, June 12-18**
Medical School **instruction ends** for 3rd-year students	**Fri, June 14**
Academic and administrative **holiday**	**May 27**

School of Veterinary Medicine

School of Veterinary Medicine

Information:
School of Veterinary Medicine
1044 Haring Hall
752-1383

The Doctor of Veterinary Medicine (D.V.M.) degree is granted upon completion of a course of study that usually requires eight years. The final four years must be spent in the professional veterinary medical curriculum. Most students planning a career in veterinary medicine broaden their educational experience by completing the baccalaureate degree before applying to the professional school.

PREPROFESSIONAL TRAINING AND REQUIREMENTS

Applicants must complete the equivalent of at least three full academic years in an accredited college or university before entering the School of Veterinary Medicine. At the time of application, at least three-fourths of the required science courses must be completed, i.e., 45 of the 58 quarter units listed below. Courses taken at other institutions may vary in units. In such cases, the unit value of the corresponding UCD courses will be used when calculating the minimum 45 units of science courses necessary in order for the applicant to qualify for review.

You should plan your preveterinary medical education carefully. The required courses should be spaced to permit maximum scholastic achievement. The undergraduate program should include plans for obtaining a baccalaureate degree. An undergraduate major should be selected on the basis of individual interest and aptitude; there is no advantage gained toward admission by selecting one major over another. Many students planning to enter veterinary school have definite areas of interest within the general field of veterinary medicine. These individuals are encouraged to take courses (for example, computer science, agricultural economics, molecular and biochemical genetics) which will broaden their background in these areas. Some specialized areas include laboratory animal medicine, exotic animal medicine, public health, food animal practice, and biomedical research. Veterinary and animal experience is consid ered an important part of your preprofessional training. This requirement can be fulfilled with twenty-week equivalents (800 hours) of relevant animal experience with types of activities that give an applicant an appreciation and understanding of the profession of veterinary medicine.

Subject Requirements	Quarter Units
Science courses	**58**
Chemistry (general, qualitative, organic, and biochemistry)	24
Genetics	3
Physics (general)	9
Physiology (systemic)	5
Biology, zoology, embryology (including laboratories)	17
English composition and additional English or rhetoric	**8**
Statistics	**4**
Total	**70**

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

		Units
Biological Sciences 1	(5)	5
Physiological Sciences 101A or Biochemistry 101A	(4,3)	3
Chemistry 1A, 1B, 1C, 8A, 8B	(5,5,5,3,3,)	21
English 1 and additional English or rhetoric	(4,4)	8
Genetics 100A or 120	(3,4)	3
Statistics 13 or Agricultural Science and Management 150	(4,4)	4
Physics 2A, 2B, 2C	(3,3,3)	9
Physiology 110	(5)	5
Zoology 2-2L, 100-100L	(4-2, 4-2)	12
	Total	**70**

If you complete the requirements in an institution other than the University of California, Davis, you are urged to check carefully the catalog of your college to be sure you are taking courses comparable in content.

Application Procedures

Students are admitted to the School of Veterinary Medicine only in the fall. Application forms may be obtained any time after August 15 by writing to the Office of the Associate Dean—Student Services, School of Veterinary Medicine, University of California, Davis, CA 95616 or by calling (916) 752-1383. Applications, accompanied by a nonrefundable application fee of $35, and Graduate Record Examination (GRE) scores for both the General Aptitude Test and the Advanced Test in Biology must be received by this office no later than *November 1*. Therefore, GRE scores received from the October administration or later administrations of the year the application is filed will not be accepted for consideration. The GRE must be taken within the five-year period prior to the time the application is submitted. At least three-fourths of the required science units must also be completed.

Students interested in admission to the School of Veterinary Medicine are urged to request an *Announcement of the School of Veterinary Medicine* at an early date so that all minimum academic requirements and deadlines are met.

Admission to the School of Veterinary Medicine

Evaluation is based on academic and nonacademic records. The academic record is divided into the required science grade-point average, cumulative grade-point average, and grade-point average for the last year of undergraduate studies. The scores from the Graduate Record Examination are included in the evaluation of your academic record. The principal 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 in the required science courses is a very important criterion for admission to the School, the Passed/Not Passed option should be avoided.

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 3 to 4 applications from Californians for each of the 122 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 333. Specific questions should be addressed to the Legal Analyst—Residence Matters, 590 University Hall, University of California, Berkeley, CA 94720. No other persons are qualified to give rulings on residency. In cases where exceptions are made, first preference is given to residents of states participating in the Western Interstate Commission for Higher Education (WICHE). For this reason, an application form will be available only to California residents and individuals from WICHE states. Students residing in WICHE states that do not have a school of veterinary medicine and who wish to participate in this program must be certified by their home state. For the address of state certifying officers, write to the Western Interstate Commission for Higher Education, Post Office Drawer P, Boulder, CO 80302.

Men and women are considered on an equal basis. Socially and economically disadvantaged students are encouraged to apply.

DEGREES

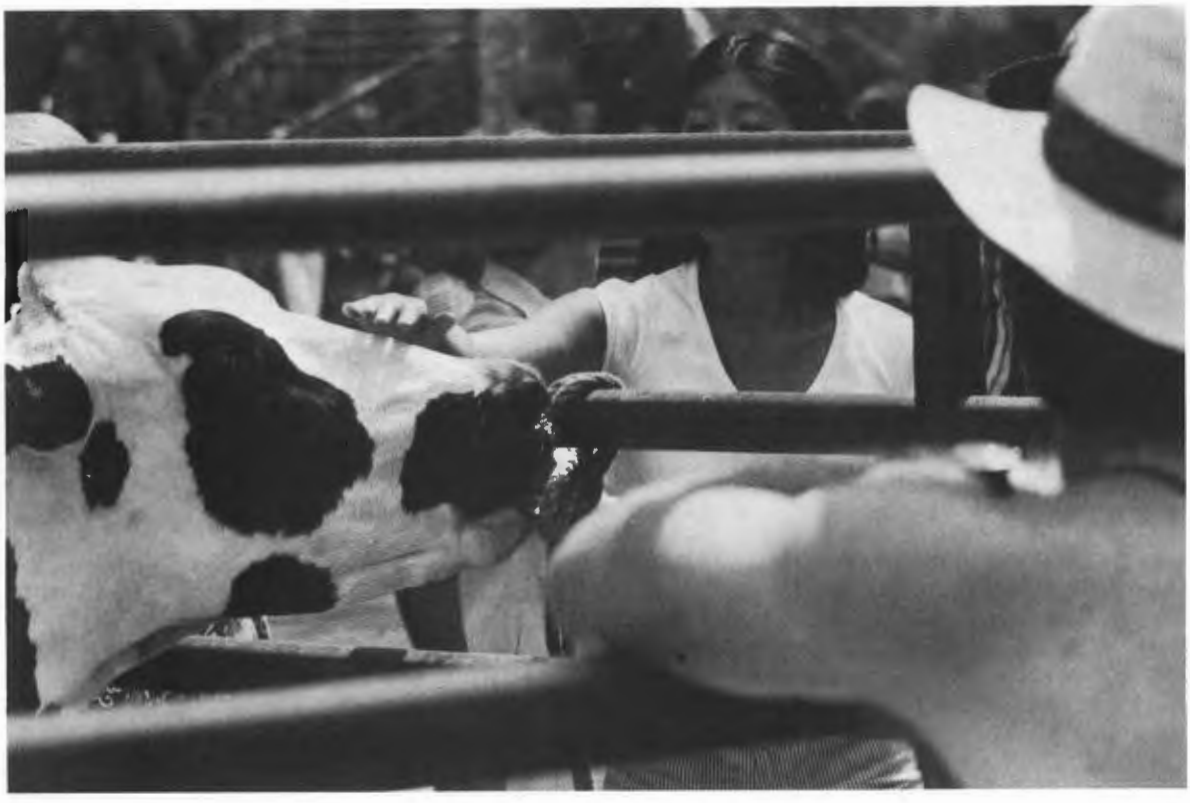
Requirements for the Bachelor of Science Degree in Veterinary Science

Any student in the School of Veterinary Medicine who does not hold a baccalaureate degree, but has satisfactorily completed the first two years of the professional curriculum and has satisfied the general University requirements (see page 61), is eligible to receive a Bachelor of Science degree in Veterinary Science.

Requirements for the Doctor of Veterinary Medicine Degree

A candidate for the Doctor of Veterinary Medicine degree must comply with the following requirements:

- Fulfill the academic standards set forth by the Faculty of the School of Veterinary Medicine
- Possess good moral character
- Study veterinary medicine for the equivalent of 12 quarters of 12 weeks each (the last six quarters must have been spent in the School of Veterinary Medicine, University of California, Davis)
- Maintain a grade-point average of 2.0 (C), computed on all courses taken in the School
- Satisfactorily complete all required work as determined by the Faculty of the School



The Master of Preventive Veterinary Medicine Degree

Applicants for candidacy to the Master of Preventive Veterinary Medicine (MPVM) degree program must have completed the Doctorate in Veterinary Medicine or the equivalent, and must have their applications approved by the MPVM program director. An option should be selected from the four listed below at the time of application. Completed application materials must be submitted no later than *ninety days prior to the quarter of planned enrollment.* Application forms can be requested from the Director, MPVM Program, School of Veterinary Medicine, University of California, Davis, CA 95616.

Candidates for the MPVM degree must satisfactorily complete in residence a minimum of 28 quarter units of required course work and additional units of approved electives to total 40 quarter units. In addition, a research project must be completed for which a written report and an oral presentation are required. A three-member review committee reviews each paper, with an oral examination by the student optional. No more than 12 units in any quarter can be earned for research.

The degree program extends over a minimum of twelve months to a maximum of two years. Students who intend to complete the program in one calendar year must enroll in August unless they have recently completed and performed satisfactorily in a statistics course that has been approved by the MPVM Program Director at the time of the student's acceptance into the program. Students meeting this requirement may enroll at the beginning of the Fall Quarter in late September. Students who intend to remain in the program for more than one year may enroll in the optimal course sequencing, but arrival in August is recommended.

Four options offered under the MPVM Program permit students to select an area of study that best identifies their individual interests and needs. The options are as follows:

1. *Epidemiology and Herd Health Management*
   (statistics, epidemiology, animal health economics, and disease control)
2. *Veterinary Public Health*
   (veterinary medicine applied to food safety and zoonoses)
3. *Laboratory Services*
   (roles of diagnostic laboratories in animal disease surveillance and disease control)
4. *Veterinary Programs Administration*
   (administration of programs for control of animal diseases, veterinary laboratories, research, or educational veterinary service)

Inquiries regarding the program should be directed to the Director MPVM Program, School of Veterinary Medicine, University of California, Davis, CA 95616.

The Master of Science and Doctor of Philosophy Degrees

General information regarding these degrees will be found in the *Announcement of the Graduate Division,* which may be obtained from the Graduate Division on the Davis campus. Additional detailed information may be obtained by writing the chairperson of the department in which you wish to study.

Programs and Courses

ACADEMIC CREDIT

Academic work at the University is measured by "units of credit." In conjunction with the letter grade you receive from the course instructor, units of credit give a fairly accurate evaluation of the amount of time you have devoted to a given subject. Units of credit also make it possible to anticipate the amount of work involved in a particular course, as well as enabling you to transfer from one campus or university to another without undue difficulty.

The way units of credit are assigned to courses is based on the "Carnegie unit" which assigns one unit of cred it 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 as signed to a course you should check the "Expanded Course Descriptions" (If your college or department provides them) or inquire from the instructor about what the course will require in the way of outside reading, term papers, problem sets, field trips, and the like. These are not always spelled out completely in the General Catalog. By knowing the amount of work which will be required, you can plan your course-load more systematically and realistically.

COURSE DESIGNATIONS

The *Class Schedule and Room Directory,* available several weeks before the beginning of each quarter, gives class hours and room numbers, as well as the most up-to-date information on registration and enrollment procedures. A supplement with changes to the General Catalog and *Class Schedule and Room Directory* is available near the time for enrollment each quarter.

Here is a sample of how a course is listed in this Catalog.

Top line:
course number;
title;
units;
quarters offered;
instructor(s) . . . . . **1. Physical Education for Men and Women** (4) I, II, III. The Staff (Chairperson in charge)

Paragraph following:
course setup;
prerequisite;
description;
grading if other than letter grading. . . . . Laboratory—2 hours. Prerequisite: at least freshman standing. Section in: a) sports skills, rules and strategy; b) physical fitness and personal health; c) recreation; d) dance; and e) intercollegiate athletics. May be repeated for a total of 6 units. (P(NP grading only.)

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 1984 would be an even-numbered year and Winter and Spring Quarters 1985 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.

UNDERGRADUATE COURSES

Lower-Division Courses

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

Variable-Unit Courses (See below for enrollment procedures) are primarily student-designed and the amount of credit given varies:

- **92 (Internship) courses** enable individual students to obtain practical experience to complement their educational goals or to explore potential career interests and opportunities.
- **97T (Tutoring) and 97TC (Tutoring in the Community)** are courses for students desiring to tutor in a subject in which they are proficient—generally in their major field—while enrolled as an undergraduate.
- **98 (Directed Group Study)** courses are set up on a one-time basis for a group of students in a subject for which no regular courses have been established.
- **99 (Special Study for Undergraduates)** is a course arranged for an individual student who shares with an instructor an academic interest which cannot be accommodated within the formal course structure.

Autotutorial Courses are courses in which students instruct themselves at their own pace. These courses can be identified by the letters AT on their course numbers, e.g., 1ATA-1ATB-1ATC, 31ATA, 31ATB.

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

Upper-Division Courses

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

Variable-Unit Courses (see below for enrollment procedures) for upper-division credit include:

- **192 (Internship)** courses enable individual students to obtain practical experience to complement their educational goals or to explore potential career interests and opportunities. Students must have completed 84 units prior to enrollment.
- **194H (Special Study for Honors Students)** courses are for individual students with honor status, as determined by the department offering the course, and who have completed 84 units.
- **197T (Tutoring) and 197TC (Tutoring in the 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 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 a suffix of the letters AT on their course numbers.

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

Registration for Variable-Unit Courses

Registration in the above variable-unit courses (numbered 92, 97T, 97TC, 98, 99, 192, 194H, 197T, 197TC, 198, 199) must be approved by the chairperson of the department concerned in a proposal submitted by the instructor in charge. The subject matter in these courses must fall within the instructor's professional competence. These courses, unless otherwise noted, are graded on a Passed/Not Passed basis *only*. Under special circumstances, an instructor may request from the appropriate college or school Committee on Courses of Instruction approval to award letter grades (except 92, 192 courses). The request must be submitted by the instructor within the first ten days of instruction of the quarter in which the course is offered. Such requests, however, are not automatically approved.

In *Special Study Courses* (numbered 99, 194H, 199), credit is limited to a total of five units per term.

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

GRADUATE COURSES

Courses **numbered 200-299** are open to students who have completed 18 units of upper-division work basic to the subject matter of the course. However, admission is subject to the approval of the instructor in charge of the course. Grading in 290C courses and variable-unit 299 or 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. Included are courses designed to provide instruction to teaching assistants.

OTHER PROFESSIONAL COURSES

Courses **numbered 400-499** are in departments and schools other than the Department of Education. Graduate students should consult their faculty adviser or contact the Graduate Division before enrolling in 400 series courses to determine if graduate credit may be awarded for the course in question (also note c footnote in prerequisites).

Note: Undergraduates should refer to their college's section regarding any restrictions on degree credit for courses in the 200, 300, or 400 series.

INDEPENDENT STUDY PROGRAM

Information:
752-2231

The Independent Study Program is intended to provide an opportunity for upper-division students to design and pursue a full quarter (12-15 units) of individual study in an area of their special interest.

Under the current system of numbering courses, a program qualifying as Independent Study will consist of one or more courses in the 190-199 series, adding up to a quarter's work. While the theme of such a program may be reasonably broad, a recognizable common thread should unite all the academic work you undertake during an independent study quarter. Regularly offered formal courses will therefore only be acceptable as a part of such a pro gram if they clearly fit its theme and contribute something essential toward the realization of its objectives. The program is definitely not to be considered as merely a way to take more variable-unit courses than normally permitted.

The procedure for enrolling in an Independent Study Program is as follows:

1. Develop, in general terms, a plan of study;
2. Locate a faculty sponsor or panel of sponsors, and with their help and approval develop a detailed plan;

3. Complete a project proposal form (obtained from the Academic Senate Office) and submit it to the Academic Senate Committee on Courses of Instruction.

Deadlines will be about two weeks prior to the final enrollment date in the quarter preceding the proposed independent study quarter (see the Calendar on page 4).

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

For further information contact the chairperson of the Committee on Courses of Instruction, c/o Academic Senate Office, in person or by phone.

INDIVIDUAL MAJOR PROGRAMS

Opportunities for interdisciplinary programs tailored to your own educational objectives are offered by the "Individual Major" in the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science (see page 234).

INTERNSHIP PROGRAM

The objective of the Internship Program is to enable students to obtain practical educational experience which will complement and enhance the traditional educational process. An internship should aid individual students who wish to explore potential career opportunities and assist them in clarifying their personal and educational goals.

Students may undertake an internship by enrolling in a course numbered 92 or 192 under departmental listings. Course 192 requires a minimum of 84 units prior to enrollment. These courses are initiated by the student well in advance of enrollment by first obtaining a "Request for Approval of Internship for Academic Credit" form from the office handling the desired 92 or 192 course, and then making arrangements with a faculty sponsor who subsequently obtains the signature of the department chairperson. The student presents a copy of the approved request form to the Work-Learn and Career Planning and Placement Office on campus and enrolls for the course by Add card through the department involved. (See page 000 for Public Affairs internship procedures.) The deadline each quarter is the last day for adding courses to the study list.

A maximum of 12 units of internship courses, whether taken at UCD or elsewhere, may be counted toward the 180 units minimum required for graduation.

EXTRA-SESSION COURSES

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

SUMMER SESSION COURSES

If you are a regularly enrolled student or are planning to enroll for the Fall Quarter, you can receive credit toward the degree in Summer Sessions courses.

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. On your transcript UCD Summer Sessions courses are identified by the letter S preceding course numbers.

UCD Summer Sessions courses may be audited for a fee of $70 per session with the following constraints: no laboratory (including language laboratories) courses may be audited; consent of the instructor is required; and in courses with restricted enrollment regularly enrolled summer session students have priority over auditors. See page 18 and the Summer Sessions bulletin for detailed information.

CONCURRENT COURSES

Where classroom space permits and the instructor gives permission, enrollment may be granted to members of the community in regular courses offered on the Davis campus. Such work may be used for admission consideration and for degree recognition. See page 45 for more information.

UNIVERSITY EXTENSION COURSES

Simultaneous enrollment in resident courses and in Extension courses is permitted only with the approval

of the dean of your college or school. Credits may also be earned, but previous authorization is necessary.

University Extension courses are identified by the letter X preceding course numbers: XD (equivalent) courses are the same as regular UCD courses in title and topic; XDC (concurrent) courses are regular UCD courses in which Extension students may enroll.

Extension courses are not accepted as part of the University residence requirement, and cannot be used to effect a transfer from one campus of the University to another. Grades earned in University Extension courses are not used in calculating individual grade-point averages (see page 56).

KEY TO FOOTNOTE SYMBOLS

The following symbols are used throughout the Majors and Courses section to indicate:

* Not to be given 1984-85

† Approved for graduate degree credit

[1] Absent on leave, 1984-85

[2] Absent on leave, Fall Quarter 1984 (Semester, for Law School)

[3] Absent on leave, Winter Quarter 1985

[4] Absent on leave, Spring Quarter 1985 (Semester, for Law School)

[5] In residence at President's Office (university Administration)

[6] In residence at another campus

The course offerings listed in this catalog are subject to change without notice. For more current quarter offerings, refer to the *Class Schedule and Room Directory* available in the UCD Bookstore. A Supplement to the *Class Schedule and Room Directory* and *General Catalog* is published quarterly and is available at the beginning of preenrollment periods.

Administration, School of

Gary M. Walton, Ph.D., Dean

School Office, 308 Voorhies Hall
(752-7362/7363)

Faculty

Nicole W. Biggart, Ph.D., Assistant Professor *(Administration, Sociology)*
Richard Castanias, Ph.D., Assistant Professor
Richard C. Dorf, Ph.D., Professor *(Administration, Electrical and Computer Engineering)*
George W. Downs, Jr., Ph.D., Associate Professor *(Political Science)*
Paul A. Griffin, Ph.D., Associate Professor
Constance Helfat, Ph.D., Assistant Professor
Herbert Johnson, Ph.D., Assistant Professor
Chester O. McCorkle, Jr., Ph.D., Professor *(Agricultural Economics)*
Seev Neumann, Ph.D., Visiting Professor
David M. Rocke, Ph.D., Associate Professor
Thomas Russell, Ph.D., Visiting Associate Professor
Paul A. Sabatier, Ph.D., Associate Professor *(Environmental Studies)*
Seymour I. Schwartz, Ph.D., Professor *(Environmental Studies)*
David F. Shanno, Ph.D., Professor
Arthur M. Sullivan, Ph.D., Assistant Professor *(Administration, Economics)*
Jerome J. Suran, B.S., Ph.D. (hon.), Senior Lecturer *(Administration, Electrical and Computer Engineering)*
Gary M. Walton, Ph.D., Professor *(Administration, Economics)*
William Wecker, Ph.D., Associate Professor

Courses in Administration

Graduate Courses

201A-201B. Accounting, Budgeting and Control (3-3) I-II. Griffin
Lecture—3 hours. Prerequisite: graduate standing. Introduction to basic principles of accounting, budgeting and control. Basic accounting, financial reporting, cost accounting, planning and budget formulation, management control techniques, operational control and auditing, strategies in financial reporting, and management information.

202. Organizational Decisionmaking (3) I.
Lecture—3 hours. Prerequisite: graduate standing. Applicability of organizational theories and models to decision-making in complex organization, public and private. Organizational control structures and patterns of development and change are considered as are organizational responses to environments and market structures and role of the executive. Case Studies.

203. Comparing Public and Private Management (3) II. Biggart
Lecture—3 hours. Prerequisite: graduate standing. Comparison of public and private management in terms of organizational environments, interaction and external controls. Attention given to similarities and differences between different types of organizations and the interaction among them in regulated markets.

204A-204B. Economic Analysis for Management (3-3) I-II. The Staff (Sullivan in charge)
Lecture—3 hours. Prerequisite: introductory knowledge of microeconomics strongly recommended. Economic reasoning applied to resource allocation in public and private sectors. Classic optimization and the price system. Macroeconomic and financial theories. Concepts of welfare economics, externalities, and special problems of collective choice. Economic effects of government taxation and regulation.

205A. Quantitative Analysis (3) I, Rocke
Lecture—3 hours. Prerequisite: introductory knowledge of statistics strongly recommended. Designed to give understanding of role of quantitative analysis in decision making and develop skills sufficient to allow application of these tools to problems encountered in both public and private sectors. Introduction to quantitative analysis, probability and inference, and regression analysis.

205B. Quantitative Analysis (3) II.Shanno
Lecture—3 hours. Prerequisite: course 205A. Designed to give understanding of role of quantitative analysis in decision making and develop skills sufficient to allow application of these tools to problems encountered in both public and private sectors. Decision analysis, linear programming and optimization, and simulation.

205C. Quantitative Analysis (3) III. Rocke, Dorf
Lecture—3 hours. Prerequisite: course 205B. Designed to give understanding of role of quantitative analysis in decision making and develop skills sufficient to allow application of these tools to problems encountered in both public and private sectors. Forecasting and management information systems.

206. Policy Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: graduate standing. Comparison of techniques for planning, implementation, and evaluation in public and private sectors. Includes cost benefit analysis, project feasibility, and economic-, social-, political-appraisals for project analysis. Product development issues include market planning, demand analysis, and production planning. Case studies.

207. Finance: Public and Private (3) III. The Staff
Lecture—3 hours. Prerequisite: graduate standing. Comprehensive overview of financial issues in public and private management, sources and means of acquiring funds, implication of taxation for productivity, investment and income distribution, interactions in capital and securities markets, impact on interest rate and capital availability.

208. Marketing Management (3) III. Bechtel
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Analysis of marketing decisions from the viewpoint of managers with emphasis on both business and nonbusiness applications. Includes consumer behavior, competitive structure of markets, legal environment, marketing research, pricing strategy, product development, channels of distribution, advertising, promotion, planning.

209. Program Evaluation (3) III. The Staff
Lecture—3 hours. Prerequisite: graduate student standing. Focuses on quantitative procedures for assessing efficiency and effectiveness of policies and programs. Statistical topics include experimental design, randomization, time series, regression effects, quasi-experimental design, etc. Advantages and limitations of various kinds of evaluation designs explored in depth.

210. Law and Legal Process (3) III. The Staff
Lecture—3 hours. Prerequisite: graduate student standing. Introduction to law and legal process in the United States. Sources of law. Structure and operation of courts, federal-state relationships, fundamentals of administrative law, fundamentals of business law.

217. Organizations, Environments, and Policy (3) I.The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Focuses on the relationship between organizations and their environments—how organizations influence their environments and how the environment constrains organizations. Includes techniques for the analysis of interaction between markets, firms, and agencies; influence on business and government policy.

***220. Public Budgeting and Finance** (3) II. Sullivan
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Fiscal role of government in a mixed economy and democratic society; economics and politics of taxation and resource allocation; intergovernmental financial relations; budgeting activities of local governments.

224. Human Resources Management (3) I, Biggart
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Problems of recruiting, training, motivating, compensating, and separating workers in contemporary organizations. Topics include design of incentive systems, career management, professionalization, alienation, worker burnout, organizational deviance, and current issues such as affirmative action and the unionization of public employees.

225. Labor Relations (3) II. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Course deals with labor organization, employment relationships, employer-employee negotiations, contracts, and litigation. Worker and management rights, and collective bargaining in the public and private sectors will be explored.

228. Private and Public Sector Productivity Analysis (3) III. Helfat
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Sources of productivity advance and the effects of productivity gains on prices and costs in different sectors, market settings, and organizations are studied. Measuring productivity, methods of improving productivity, and implementing innovations in the private and public sectors are analyzed.

229. Regulation (3) II. Helfat
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Course addresses topics in government regulation with emphasis on the interplay between technology and regulation. Examples of economic regulation, health and safety regulations, consumer protection regulations, antitrust and other issues are covered. Issues of deregulation are also stressed.

230. Urban Administration and Politics (3) II. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Role of urban administrator in policy formulation, implementation, and evaluation. Political forces affecting management at county and city level—interest groups, parties, elected officials, bureaucracies, other levels of government. Management of financial and human resources, and the delivery of services.

231. Intergovernmental Systems and Administration (3) III. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Intergovernmental dimensions of public management, particularly how policies of higher levels of government shape administrators' actions at other levels of government. Attention given to grants and contracts, regulations, fiscal devices, technical assistance, and to various substantive policy areas.

232. Urban Policy and Planning (3) I, Sullivan
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Analysis of public policy in an urban setting, focusing on the efficiency effects of such policies. Topics include urban spatial structure, growth-management policies, housing, transportation, environmental quality, local government finance, and urban planning.

233. Regulation and Policy in Agriculture (3) I, McCorkle
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Implications for management of regulation and public policy on agricultural production choices, practices, processing and marketing; influences on management strategy, organization, business practices, and resource productivity; trends in regulation and policy and their potential for management strategies are explored.

240. Management Policy (3) I, Suran
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. General management overview of the process of choosing and defining purposes and objectives, formulating and implementing strategy, and monitoring strategic performance and results. Kinds of problems and issues that affect the success of the entire organization are highlighted.

241. Managerial Decision Making (3) I. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Develops analytical skills for evaluating decisions and solving problems in various managerial settings. Emphasis is on problem structuring, decision analysis, and implementation. Course examines individual decision strategies, group processes, and organizational decision making.

242. Competitive Analysis (3) II. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Applies quantitative and behavioral analysis to decision problems involving competition. Problem areas include competitive analysis of pricing, bidding, and bargaining situations. Course considers aspects of negotiations in labor relations, arbitration, mergers, and regulation.

243. Risk Management (3) III. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Analyzes managerial problems in which uncertainty and risk are crucial elements in decision making. Problem areas include societal risks, insurance, financial investments, hedging, and new ventures. Course develops a unified framework for analyzing risk in various contexts.

244. New and Small Business Ventures (3) III. Dorf
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Emphasizes starting a new business venture or managing a small, ongoing business during its formative stages. The business plan. Legal forms, financial considerations, the management team. The entrepreneur. Students develop a detailed business plan.

248. Marketing Strategies (3) III. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Examines process by which organizations develop strategic marketing plans. Includes definition of activities and products marketing audits, appraising market opportunities, design of new activities and products, and organizing marketing

NOTE: For key to footnote symbols, see page 123.

planning function. Applications to problems in private and public sector marketing.

249. Marketing Research (3) II. Rocke
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Courses addresses the managerial issues and problems of systematically gathering and analyzing information for making private and public marketing decisions. Covers the cost and value of information, research design, information collection, measuring instruments, data analysis, and marketing research applications.

250. Technology Management (3) II. Suran
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Management of the engineering and technology activity. Functions of design, planning, production, marketing, sales, and maintenance. Technological product life cycle. Research and development activity. Project planning and organization. Manufacturing issues. Case studies.

251. Planning for the Technological Enterprise (3) II. Dorf
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. New product planning function. Management of innovation. Strategic planning, setting objectives. Organizing for planning. Financial, resource, manufacturing, market planning. Technology assessment. Risk assessment. Program and project selection and evaluation. Technology forecasting. Regulation. Case studies.

252. Production and Operations Management (3) II. Wecker
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Explores methods of increasing operational efficiency in production and service organizations through planning and scheduling, materials management, inventory control, quality control, and distribution. Methodologies employed include such techniques as programming, simulation, systems analysis, queueing, and network models.

260. Financial Management (3) I, Castanias
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Focuses on planning, acquiring, and managing a company's financial resources. Includes discussion of financial aspects of mergers and other forms of reorganization; analysis of investment, financial, and dividend policy. Theories of optimal capital structure.

261. Investment Analysis (3) I, Castanias
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Examines modern asset pricing theory and the implications of that theory for the analysis and management of stocks, bonds, and other financial securities. Factors influencing the value of stocks, bonds, options, warrants, and other securities are discussed from the perspective of a portfolio fund manager.

262. Money and Security Markets (3) I, Helfat
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Examines how money, securities markets are organized; how public agencies, businesses, others obtain and invest funds in those markets. Relationship between interest rates, monetary policy, government's role in improving capital markets, approaches to assessing changes in regulation in specific markets.

263. Options and Futures Markets (3) III. Castanias
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Studies the behavior of options and futures markets; how public agencies, businesses, others use those markets. Studies nature of various strategies (e.g., speculation) involving options, commodity, financial futures contracts. Price determination in options and futures markets is also examined.

264. Business Taxation (3) III. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Analysis of the impact of business taxation on investment, production, and finance decisions. Discussion of the relationship between business organization and tax liability. Course is not intended for tax specialists.

270. Corporate Financial Reporting (3) I, Griffin
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Analyzes and evaluates contemporary issues in financial reporting and develops implications of those issues for business decision makers, investment managers, and accounting policy makers.

271. Accounting and Budgeting for Management Control (3) I. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Examines concepts and techniques of accounting and budgeting for management decision making in the private sector. Topics include cost control, capital budgeting, performance evaluation, and the effects of uncertainty in achieving management objectives.

272. Evaluation of Financial Information (3) II. Griffin
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Studies how investors, creditors, others use accounting and other information in making rational investment, lending decisions. Emphasis is placed on the analysis of financial information in a variety of contexts. Where applicable, recent research in finance and economics is discussed.

273. Auditing, Internal Control and Public Accounting (3) III. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Concentrates on role of the independent public accountant as auditor and consultant, from the perspective of an enterprise manager. Auditing standards, auditing procedures, and auditing control techniques are discussed. Emphasis is also given to current issues confronting the accounting profession.

280. Information Systems and Management (3) I, Shanno
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Covers the role of information systems in management, organizational issues in implementation and usage of management information systems, computer technology for management information systems, information systems analysis and design, and management of information systems.

281. Decision Support Syatems (3) III. Shanno
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Considers the design and use of computer systems in assisting managers in their decision making for unstructured tasks. Examines general purpose time-sharing systems, graphics, telecommunication, data-base management, application packages, management decisions, support systems, and case studies.

282. Simulation and Systems Analysis (3) II. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Analyzes computer models for studying the simulated behavior of systems of interrelated elements. Covers deterministic and stochastic simulation methods, model design, output analysis, and related topics. Applications are made to management decision problems.

283. Optimization Theory and Applications (3) I. The Staff
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Introduces applied optimization theory. Examines linear, nonlinear, discrete, and dynamic programming; optimality conditions; transportation, networks, and large-scale systems; and computer implementation. Applications are made to problems in private and public management.

284. Applied Linear Models for Management (3) II. Rocke
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Covers regression, analysis or variance, and multivariate analysis. Topics will focus on applications to management and policy problems.

285. Time Series Analysis and Forecasting (3) III. Wecker
Lecture—3 hours. Prerequisite: completion of Administration core requirements or by petition with consent of instructor. Considers application of time series methods to evaluation and forecasting problems. Covers univariate and multivariate ARIMA models and transfer function models. Applications will be in such areas as economics, finance, budgeting, program evaluation, and industrial process control.

***290A-290B. Seminar in Administration: Research and Practice** (4-4) I-II, II-III. The Staff
Seminar—4 hours. Prerequisite: completing or completion of fourteen courses toward degree in School of Administration. Practical application of research and previous course work to the solution of a practice managerial problem. (Deferred grading, pending completion of course sequence.)

298. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. Special topics in administration.

299. Individual Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. Research projects in administration. (S(U grading only.)

Afro-American Studies

(College of Letters and Science)

[2,3]Jacquelyn Mitchell, Ed.D., Program Director

Program Office, 467 Kerr Hall (752-1548)

Committee in Charge

Daniel J. Crowley, Ph.D. *(Anthropology, Art History)*
Richard T. Curley, Ph.D. *(Anthropology)*
Carl C. Jorgensen, Ph.D. *(Sociology)*
[2,3]Jacquelyn Mitchell, Ed.D. *(Afro-American Studies, Applied Behavioral Sciences)*
Donald S. Rothchild, Ph.D. *(Political Science)*
Joe W. Trotter, Jr., Ph.D. *(History)*

Faculty

[2,3]Jacquelyn Mitchell, Ed.D., Assistant Professor *(Afro-American Studies, Applied Behavioral Sciences)*
Lako Tongun, Ph.D., Lecturer

The Major Program

The Afro-American Studies Program attempts to provide students with directed, in-depth intellectual exposure to the ideas, lifestyles, history and political behavior of black peoples throughout the world. Though the courses offered by ther Program are disproportionately concerned with Afro-America, affiliated courses offered by instructors formally housed in other departments throughout the University broaden students' accessto courses on Africa, Afro-America, and other black experiences throughout the diaspora. Students intent upon choosing an Afro-American Studies major or minor should anticipate a close working relationship with a faculty member.

Upon Completion of this program, students will be prepared for graduate work leading to a teaching credential or any discipline requiring a broad social science or humanities background.

Afro-American Studies

A.B. Major Requirements:

(The major program is in the process of being revised. Direct your questions to the Program Office.)

Major Advisers. J. Mitchell, L. Tongun.

Minor Program Requirements:

(The minor program is in the process of being revised. Direct your questions to the Program Office.)

Minor Advisers. Same as for Major Advisers.

Teaching Credential Subject Representative. See page 98 for the Teacher Education Program.

American History and Institutions. This University requirement can be satisfied by completion of Afro-American Studies 10, 100, 120, 121. (See also page 61.)

Courses in Afro-American Studies

The following courses are in the process of being revised. Direct your questions to the Program Office.

Lower Division Courses

10. Introduction to Afro-American Studies (4) I.
Lecture—4 hours. Introduction to a range of Afro-American Studies materials dealing with Black social, religious, economic, migratory, and political movements of the late nineteenth through the twentieth century.

15. Introduction to Afro-American Humanities (4) III.
Lecture—4 hours. Introduction to Afro-American cultural

NOTE: For key to footnote symbols, see page 123.

tradition as it evolved from West Africa to the Carribean, South America and North America via slavery.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Ethnic Studies (3) III. Mitchell
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.

***101. Introduction to Research in the Afro-American Community** (4) II. Mitchell
Lecture—4 hours. Prerequisite: course 10 or consent of instructor. Introductory survey of Afro-American Studies methods and techniques; problems and methodology in Afro-American Studies.

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

120. Afro-America: Pre-Emancipation (4) II.
Lecture—4 hours. Prerequisite: course 10 or consent of instructor. Ecology, social organization, and survival culture of Afro-America. Historical and comparative study of Afro-American populations in relation to other groups.

***121. Afro-America: Post-Emancipation** (4) II
Lecture—4 hours. Prerequisite: course 10 or 120 or consent of instructor. Analysis of contemporary Afro-American cultural adaptations and social organizations within the United States.

123. The Black Female Experience in Contemporary Society (4) III. Mitchell
Lecture—4 hours. Prerequisite: upper division standing or consent of instructor. Black female social, intellectual, and psychological development. Black women's contributions in history, literature, and social science; life experiences of Black women and philosophical underpinnings of the feminist movement. Offered in even-numbered years

133. The Black Family in America (4) II.
Lecture—4 hours. Prerequisite: upper division standing or consent of instructor. Analysis of social science research to examine relationship between Black family structures, patterns of functioning, and political, economic and social conditions. Examination of role differentiation within families by race and social class. Offered in odd-numbered years.

***150A. The Afro-American Visual Arts Tradition: A Historical and Cultural Study** (4) I. The Staff
Lecture—4 hours. Prerequisite: upper division standing. Afro-American visual arts tradition, folk and formal, in historical and cultural context, from 1600 through Reconstruction.

***150B. The Afro-American Visual Arts Tradition: A Historical and Cultural Study** (4) II. The Staff
Lecture—4 hours. Prerequisite: upper division standing. Afro-American visual arts tradition, folk and formal, in historical and cultural context, from Reconstruction to present.

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

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

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

Professional Course

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

Agrarian Studies

(College of Agricultural and Environmental Sciences)

The Major Program

Agrarian Studies is a multidisciplinary program designed for students who seek the "broad-view" and are challenged by the scientific, philosophical, and cultural concepts important to an understanding of agriculture and its relationship to man. Through a purposeful integration of science and the humanities the major provides a sound general education important for effective leadership in agriculture and in many agriculturally or environmentally related aspects of business, government, international services, or teaching. Depth of understanding in your field of agricultural interest is achieved by the selection of specialized courses and in work experience that can be gained in programs offered by Bixby Work-Learn or the campus Work-Learn Center.

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

Agrarian Studies

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more compehensive courses are acceptable.)

	UNITS
Social Sciences and Humanities	**40**
Written and oral expression (see College requirement, page 71)	8
Cultural anthropology or geography (Anthropology 2 or Geography 2)	4
Philosophy of biological sciences (Philosophy 10G or 108)	4
Introduction to economics (Economics 1A)	5
Restricted Electives	19
Additional courses selected in consultation with adviser from a list† of restricted electives in 3 or more of the following fields: agricultural economics, American studies, anthropology, classics, economics, geography, history, languages,‡ political science, rhetoric, sociology.	
Natural Sciences	**58**
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Biochemistry (Biochemistry 101A, 101B) and/or upper division plant or animal physiology	6
Mathematics (Mathematics 16A plus either Mathematics 16B, 19, Agricultural Science and Management 150, Engineering 5, or Statistics 13)	6
Soil science (Soil Science 100)	4
Ecology (Plant Science 101 or Environmental Studies 100)	4
Biological sciences (Biological Sciences 1 plus Botany 2 or Zoology 2)	9-10
Restricted electives	12-13
Additional courses in 2 or more fields of science fundamental to agricultural pursuits, e.g., biochemistry, botany, genetics, microbiology, nutrition, physiology, soils, water science, zoology.	
Agrarian Studies Emphasis	**24**
Perspectives on agriculture (Agrarian Studies 2, 188)	4
Agrarian themes in literature (English 174)	4
Geography of agriculture (Geography 142)	4
Food and culture (Food Science and Technology 20)	4
History of U.S. agriculture (History 188A, 188B)	8
Agricultural Specialization	**34**
Major field	18
Courses chosen to provide depth of understanding in one of the following or closely allied fields: animal sciences, food sciences, plant sciences, resource sciences.	
Minor field	12
Closely related courses in either the natural sciences (e.g., entomology, physiology, soil and water science, etc.) or the social sciences (e.g., agricultural economics, anthropology, geography, political science, etc.) chosen specifically to enhance understanding of agriculture in a scientific *or* a cultural context.	
(Agricultural internship strongly recommended.)	(0-4)
Unrestricted Electives	**24-28**
Total Units for the Major	**180**

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

‡Proficiency in a foreign language is contributory to a general education and specifically useful to an understanding of various aspects of agriculture. Students specializing in the agricultural sciences are encouraged to choose French, German, Japanese, or Russian; those interested in agricultural heritage could well choose Greek or Latin; students preparing for international aspects of agriculture or "agribusiness" would have obvious choices based on geographical interests.

Major Adviser. R. J. Romani *(Pomology)*.

Courses in Agrarian Studies

Questions pertaining to the following courses should be directed to the instructor or to the Pomology Department, 1035 Wickson Hall.

Lower Division Course

2. Perspectives on Agriculture (3) II. Romani
Lecture—2 hours; discussion—1 hour; one Saturday field trip, one 2-hour evening session. Introduction to agrarian studies, presenting agriculture's vital role in past and current civilizations. A review of important relationships between agriculture and the natural and social sciences.

Upper Division Course

188. Special Topics in Agrarian Studies (1) III. Romani
Discussion—1 hour. Prerequisite: course 2 or consent of instructor; open to lower division students. Group study of special topics on the relationships between agriculture and the arts and sciences. May be repeated for credit.

Agricultural and Environmental Chemistry (A Graduate Group)

C.F. Shoemaker, Ph.D., Chairperson of the Group

Group Office, 1480 Chemistry Annex (752-1415/7347)

Faculty. Includes members from various departments in the Colleges of Agricultural and Environmental Sciences and Letters and Science.

Graduate Study. The Graduate Group in Agricultural and Environmental Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees. Detailed information regarding graduate study may be obtained by writing the Group Chairperson.

Graduate Adviser. W.W. Winterlin *(Environmental Toxicology)*.

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 and Environmental Chemistry

Graduate Courses

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Selected topics in agricultural and environmental chemistry, presented by students. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. The chemistry and biochemistry of foods, nutritional chemicals, pesticides, and other special topics as they apply to agricultural and environmental chemistry.

299. Research (1-12) I, II, III, summer. The Staff (Chairperson in charge)
Arrangements should be made well in advance with a member of the Group in Agricultural and Environmental Chemistry. (S/U grading only.)

Agricultural and Home Economics Education

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Applied Behavioral Sciences.

Major Programs and Graduate Study. See majors in Home Economics (page 231) and Agricultural Education (page 130); and page 94 for graduate study.

Teaching Credential Subject Representative. Secondary Teaching Credentials—J. G. Leising, 137 AOB-4 (Agriculture); B. G. Goldman, 149 AOB-4 (Home Economics). Community College Credentials—J. G. Leising, 137 AOB-4 (Agriculture).

Courses in Agricultural and Home Economics Education

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, 106 Academic Office Building–4.

Lower Division Course

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Field placement—3-36 hours. Prerequisite: lower division standing; consent of instructor. Supervised internship off and on campus in areas of agricultural education. (P/NP grading only.)

Upper Division Courses

100. Concepts in Education (2) I, II. Goldman, Leising
Lecture—2 hours; field observations. Prerequisite: upper division students. Examination of educational institutions. Implications for those entering careers in teaching. (Sect. 1, Agriculture; Sect. 2, Home Economics.)

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

163. Measurement and Evaluation in Teaching (3) II. Goldman
Lecture—3 hours. Prerequisite: elementary statistics; upper division standing. Development of selection, use and assessment of evaluation procedures for measuring cognitive, affective and psychomotor growth.

171. Audio Visual Communications (2) I, II. R. Pershing
Discussion—1 hour; laboratory—3 hours. Concepts and principles of audio-visual communications related to education. (P/NP grading only.)

172. Multi-Media Productions (3) III. R. Pershing
Lecture—2 hours; laboratory—3 hours. Prerequisite: completion of course 171 or consent of instructor. Theory and application of producing multi-media educational programs.

***180. Consumer Education** (3) III. The Staff (Goldman in charge)
Lecture—3 hours. Prerequisite: Consumer Economics 141 or 142 or Consumer Science 100. Examination of values, decision-making processes, lifestyle needs of individuals and communities as a basis for teaching of consumer education in various subject areas at all age levels. Offered in odd-numbered years.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Field placement—3-36 hours. Prerequisite: upper division standing; consent of instructor. Supervised internship off and on campus in areas of agricultural education. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Professional Courses

300. Directed Field Experience in Teaching (2) II, III. Goldman, Leising
Discussion—1 hour; field experience—3 hours. Prerequisite: course 100. Experience as teaching assistant in agriculture or home economics programs in public schools. May be repeated once for credit. (Sect. 1, Agriculture; Sect. 2, Home Economics.) (P/NP grading only.)

301. Planning for Instructional Programs (3) II, Goldman; III, Leising
Lecture—3 hours. Prerequisite: courses 100; 300 (may be taken concurrently). Major paradigms in program planning and development. Emphasis on key steps in curriculum development, including selection and organization of educational objectives, learning experiences and teaching materials and resources. (Sect. 1, Agriculture; Sect. 2, Home Economics.)

302. Teaching Methods in Education (2-3) III. Goldman, Leising
Lecture (1 hour minimum)-laboratory—4-7 hours. Prerequisite: courses 100, 300 and 301. Development of teaching strategies, with special emphasis on the designing of learning experiences, instructional execution, teaching aids. (Sect. 1, Agriculture—2 units; Sect. 2, Home Economics—2-3 units.)

306A. Field Experience with Future Farmers of America and Supervised Experience Programs (4) I, Leising
Lecture-discussion—2 hours; field work—6 hours. Prerequisite: acceptance into the Teacher Education Program; course 306B (concurrently). Develop an understanding of the Future Farmers of America and supervised occupational experience programs through planning, conducting, and evaluating actual programs.

306B. Field Experience in Teaching Vocational Agriculture (5-18) I, Leising
Student teaching (corresponds with public school session). Prerequisite: acceptance into the Teacher Education Program; course 306A (concurrently); courses 100, 300, 301, 302. Directed teaching including supervision of occupational experience programs and youth activities in secondary schools or community colleges.

307. Teaching in Secondary Schools (5-18) I, Goldman
Student teaching (corresponds with public school session). Prerequisite: acceptance into Teacher Education Program; courses 100, 300, 301, 302. Supervised teaching in secondary school or community college general agriculture or home economics programs. (Deferred grading only, pending completion of course.)

323. Resource Development: Agricultural Education (3) II. Leising
Lecture—3 hours. Prerequisite: courses 306A, 306B. Selection and implementation of community resources in teaching.

381. Family Life Education (3) III. The Staff (Goldman in charge)
Lecture—3 hours. Prerequisite: upper division standing; courses on the family, sex education, and teaching methods recommended. Current topics in family life education. Review of selected research, resources, curriculum, teaching strategies, and interdisciplinary approaches to family life education at all age levels. Offered in even-numbered years.

390. Seminar: Issues in Agricultural and Home Economics Education (2) II, Goldman; III, Leising
Seminar—2 hours. Prerequisite: acceptance into the Teacher Education Program; courses 306A-306B or 307. Discussion and evaluation of current issues, theories and research in home economics and agricultural education. (Sect. 1, Agriculture; Sect. 2, Home Economics.) (S/U grading only.)

Agricultural and Managerial Economics

(College of Agricultural and Environmental Sciences)

The Major Program

Agricultural and Managerial Economics focuses on the student's understanding of the total economic and social environment through study of the agricultural, biological, physical, and social sciences. The major offers an option of two areas of specialization: (a) Agricultural Economics and (b) Managerial Economics.

The Agricultural Economics option is preprofessional, essentially preparation for continued study at the graduate level. The emphasis is on the theoretical aspects which lie behind decisions concerning production, marketing, use of resources, prices, and policy. Supplemental courses are offered in statistics, effects of governmental policy, rural appraisal, and related topics.

The Managerial Economics option, while considering the theoretical, deals more with the practical managerial problems. Emphasis is on the decision-making function of management, use of scientific management controls and organization, personnel policies, and procurement and marketing methods.

Both options prepare graduates for professional management positions in financial and research institutions not necessarily limited to agriculture. Students are not admitted directly into the Agricultural and Managerial Economics major, but enter the program by filing a Change of Major Petition after fulfilling the minimal admission standards of the major. The admission standards consist of satisfactory grades in selected lower division courses. Students who are interested in the major are strongly encouraged to consult with the Advising Center for the major (see below) at their earliest opportunity.

Agricultural and Managerial Economics

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**48**
Written and oral expression (see College requirement, page 71)	8
American History and Institutions†	8
Economic principles (Economics 1A-1B)	10
Accounting (Economics 11A-11B)	8
Statistics (Statistics 13, 103)	8
Mathematics, including calculus	6
Depth Subject Matter ††	**47-53**
Micro theory, Agricultural Economics 100A, 100B	8
Quant methods, Agricultural Economics 106, 155	8
Macro theory, Economics 101 or 135	3-5
One of two options:	
(a) Agricultural economics (preprofessional)	28
Mathematics 16B	
Agricultural Economics 108	

†Students meeting the American History and Institutions requirement may substitute social sciences as interpreted under the Social Sciences Breadth Subject Matter requirement.

††Students graduating with this major are required to attain at least a C average (2.0) in all upper division Agricultural Economics, Consumer Economics, and Economics courses, plus any other upper division courses taken at the University which are restricted electives.

NOTE: For key to footnote symbols, see page 123.

Additional upper division agricultural economics and economics.

(b) Managerial economics 32
Agricultural Economics 18

Restricted electives: choose 28 units from Agricultural Economics 108, 112, 118, 120, 130, 136, 140, 143, 145, 150, 157, 171A, 171B, 190A, 190B, Economics 101, 121A, 121B, 135, 150A, 150B, 151A, 151B, 160A, 160B, Political Science 174, 188. At least 12 of these units must be chosen from Agricultural Economics 112, 118, 136, 157, 171A, 171B.

Breadth Subject Matter **32**
Agricultural and environmental sciences (excluding agricultural economics, consumer economics, and applied behavioral sciences).
Natural sciences (including mathematics beyond preparatory subject matter).
Social sciences (excluding economics), history, and philosophy.

Required: 8 units in one area and 12 units in each of the other two.

Unrestricted Electives **52-58**

Total Units for the Major **180**

Recommended Courses. Students should contact departmental advisers for up-to-date lists of courses which are acceptable for the breadth subject matter requirement.

Advising Center for the major is located in 105 Voorhies Hall.

Major Adviser. L.E. Shepard *(Agricultural Economics).*

Graduate Study. See page 94.

Agricultural Economics

(College of Agricultural and Environmental Sciences)
Warren E. Johnston, Ph.D., Chairperson of the Department
Department Office, 118 Voorhies Hall (752-1517)

Faculty

John M. Antle, Ph.D., Associate Professor
Frances A. Antonovitz, Ph.D., Assistant Professor
Bayford D. Butler, Ph.D., Visiting Lecturer
Hoy F. Carman, Ph.D., Professor
Harold O. Carter, Ph.D., Professor
[1]Robert A. Collins, Ph.D., Assistant Professor
James H. Cothern, Ph.D., Adjunct Lecturer
D. Barton DeLoach, Ph.D., Professor Emeritus
Peter H. Farquhar, Ph.D., Associate Professor
Jerry Foytik, Ph.D., Professor Emeritus
Benjamin C. French, Ph.D., Professor
Varden Fuller, Ph.D., Professor Emeritus
B. Delworth Gardner, Ph.D., Professor
Richard D. Green, Ph.D., Associate Professor
David E. Hansen, Ph.D., Associate Professor
Arthur Havenner, Ph.D, Associate Professor
Dale M. Heien, Ph.D., Associate Professor
Gerald L. Horner, Ph.D., Adjunct Lecturer
Richard E. Howitt, Ph.D., Associate Professor
Lovell S. Jarvis, Ph.D., Acting Associate Professor
Warren E. Johnston, Ph.D., Professor
Desmond A. Jolly, Ph.D., Adjunct Lecturer
Gordon A. King, Ph.D., Professor
John E. Kushman, Ph.D., Associate Professor
Sylvia Lane, Ph.D., Professor Emeritus
Elmer W. Learn, Ph.D., Professor
Samuel H. Logan, Ph.D., Professor
Marc S. Mangel, Ph.D., Associate Adjunct Professor *(Agricultural Economics, Mathematics)*
Philip L. Martin, Ph.D., Associate Professor
Douglas I. Matheson, J.D., Visiting Lecturer
Alexander F. McCalla, Ph.D., Professor
Chester O. McCorkle, Jr., Ph.D., Professor
Charles V. Moore, Ph.D., Adjunct Lecturer
Ray D. Nelson, Ph.D., Assistant Professor
Kent D. Olson, Ph.D., Adjunct Lecturer
Quirino Paris, Ph.D., Professor
A. Doyle Reed, Ph.D., Visiting Senior Lecturer
Refugio I. Rochin, Ph.D., Associate Professor
Lawrence E. Shepard, Ph.D., Associate Professor
John W. Siebert, Ph.D., Adjunct Lecturer
J. Herbert Snyder, Ph.D., Professor
Stephen H. Sosnick, Ph.D., Professor
Joe J. Stasulat, Ph.D., Adjunct Lecturer
James E. Wilen, Ph.D., Associate Professor *(Agricultural Economics, Environmental Studies)*

Major Program and Graduate Study. See the major in Agricultural and Managerial Economics (page 127) or Development, Resource, and Consumer Economics (page 167); and see page 94 for graduate study.

Major Advisers. See *Class Schedule and Room Directory.*

Related courses. See Environmental Planning and Management 110; Environmental Studies 160, 168A, 168B, 173; and courses in Consumer Economics and Economics.

Courses in Agricultural Economics

Lower Division Courses

***1. Economic Basis of the Agricultural Industry** (4)
Lecture—4 hours. Agriculture and man; the agricultural industry in U.S. and world economies; production and supply, marketing and demand; agricultural land, capital and labor markets; economic and social problems of agriculture in an urban and industrialized economy emphasizing California.

18. Business Law (4) I, III, summer. Matheson
Lecture—4 hours. Prerequisite: sophomore standing. General principles of business law in the areas of contracts, business organization, real property, uniform commercial code, sales, commercial paper, employment relations, and creditor-debtor against a background of the history and functioning of our present legal system.

49A., 49B., 49C. Field Practice (1) I, II, III. Stasulat
Discussion—1 hour; three field trips. Prerequisite: consent of instructor. Field trips and experiences to observe the various management aspects of Agricultural Production. Emphasis will be placed on developing the student's understanding and awareness of economics and management and their application in agricultural production. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Selected topics relating to agricultural economics. Intended 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

100A. Intermediate Microeconomics: Theory of Production and Consumption (4) I, ———; II, Carman; III, Howitt
Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A, 1B; Mathematics 16A. Theory of individual consumer and market demand; theory of production and supply of agricultural products, with particular reference to the individual firm; pricing, output determination, and employment of resources under pure competition. Students having had Economics 100 or the equivalent may not receive credit for this course; however, Economics 100 will not serve as prerequisite to course 100B.

100B. Intermediate Microeconomics: Imperfect Competition, Markets and Welfare Economics (4) I, Martin; II, McCalla; III, French
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A. Pricing, output determination, and employment of resources under conditions of monopoly, oligopoly, and monopolistic competition.

106. Quantitative Methods in Agricultural Economics (4) I, Paris; II, Green; III, Heien
Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 103. Statistical methods for analyzing quantitative agricultural economics data: linear and multiple correlation and regression analysis.

108. Regional Analysis: Location and Trade (3) III. French
Lecture—3 hours. Prerequisite: course 100B. Theory of regional specialization, location, and trade for agricultural products; general economic equilibrium.

112. Fundamentals of Business Organization (4) I, Logan; III, Butler
Lecture—2 hours; discussion—2 hours. Prerequisite: upper division standing or consent of instructor. The role of organizational design and behavior in business and public agencies. Principles of planning, decision making; individual behavior, motivation, leadership; informal groups; conflict and change in the organization.

113. Fundamentals of Marketing Management (4) II. Nelson
Lecture—4 hours. Prerequisite: Economics 1A. For non-majors only. Nature of product marketing by the business firm. Customer-product relationships, pricing and demand; new product development and marketing strategy; promotion and advertising; product life cycles; the distribution system; manufacturing, wholesaling, retailing. Government regulation and restraints. Students having had course 136 may not receive credit for this course.

***114. Production Management** (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A; course 113 recommended. For non-majors only. Principles and procedures for efficient use of resources in processing and handling of agricultural and other products; work scheduling; inventory control; coordination of production and sales. Students having had course 157 may not receive credit for this course.

***117. Managerial Accounting** (4) II, III.
Lecture—3 hours; discussion—1 hour. 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.

118. Tax Accounting (4) II, III. Sosnick
Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 11B. Determination of the tax liability of proprietors, partners, and corporations and the tax implications of alternative business decisions and methods of accounting.

120. Agricultural Policy (3) I, McCalla
Lecture—3 hours. Analytical treatment of recent and current economic problems and governmental policies and programs affecting American agriculture.

***125. Comparative Agriculture** (4) I.
Lecture—4 hours. Agriculture on all continents and in the principal countries; resources, organization, and operation; productivity and earnings in the farm versus the non-farm sector, and development economics.

130. Agricultural Marketing (4) I, Cothern; II, Antonovitz
Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A or the equivalent. The nature, function, organizational structure, and operation of agricultural markets; prices, costs, and margins; market information, regulation, and controls; cooperative marketing.

136. Managerial Marketing (4) I, II. Nelson
Lecture—4 hours. Prerequisite: course 100A; Statistics 13 or 103. Application of economic theory and statistics in the study of marketing. Marketing measurement and forecasting, market planning, market segmentation, determination of optimal product market mix, sales and cost analysis, conduct of marketing research, marketing models and systems.

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.

142. Personal Finance (3) I, Shepard; III, ———
Lecture—3 hours. Prerequisite: Economics 1B. Management of income and expenditures by the household. Use of consumer credit, savings, and insurance by households. Principles of tax, retirement, and estate planning. (Same course as Consumer Economics 142.)

143. Investments (3) III. Shepard
Lecture—3 hours. Prerequisite: Agricultural Economics/ Consumer Economics 142 or consent of instructor. Survey of investment institutions, sources of investment information, and portfolio theory. Analysis of the stock, bond and real estate markets from the perspective of the investor.

145. Farm and Rural Resources Appraisal (4) II, Reed; III, Johnston
Lecture—3 hours; laboratory—3 hours; field trip. Principles of farm and ranch appraisal; land utilization in relation to problems of development and valuation. Real estate instruments and elements of real estate finance.

147. Natural Resource Economics (4) I, Hansen
Lecture—3 hours; discussion—1 hour. Natural resource use problems with emphasis on past and current policies and

NOTE: For key to footnote symbols, see page 123.

institutions affecting resource use; determinants, principles, and patterns of natural resource use; property rights; conservation; private and public resource use problems; and public policy issues. Students who have had or are taking course 100A, Economics 100, or the equivalent, may receive only 2 units of credit, so must enroll in course 147M instead.

147M. Natural Resource Economics (2) I, Hansen
Lecture—3 hours; discussion—1 hour. Natural resource use problems with emphasis on past and current policies and institutions affecting resource use; determinants, principles, and patterns of natural resource use; property rights; conservation; private and public resource use problems; and public policy issues. Students who have had or are taking course 100A, Economics 100, or the equivalent, must enroll in this course (for 2 units) rather than course 147.

148. Economic Planning for Regional and Resource Development (3) II. Rochin
Lecture—3 hours. Prerequisite: Economics 1A and 1B; Mathematics 16A recommended. Relation of resources to economic growth, including regional problems; planning economic development with particular emphasis on resource use in agriculture; regional and national planning by both centralized and decentralized governments.

150. Agricultural Labor (3) I, Martin
Lecture—2 hours; discussion—1 hour; field trip. Problems, attitudes, and characteristics of agricultural employers, employees, and labor contractors. Impact of mechanization; determinants of productivity; wage levels and structures; evolution and efficiency of the labor market; placement and supervision; off-season and in-season unemployment; organization and conflict; relevant legislation.

151. Economics of Poverty (3) III. Rochin
Lecture—3 hours. Prerequisite: Economics 1A-1B or consent of instructor. Economic theories of mean distribution; causes of poverty; economic analysis of and political prospects of policies to minimize economic insecurity, maximize equality of opportunity, and establish minimum income levels.

155. Quantitative Analysis for Business Decisions (4) I, Kushman; II, Carter; III, ———
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A; Statistics 103. Introduction to selected topics in management science and operations research: decision analysis for management, mathematical programming, competitive analysis, and others.

157. Analysis for Production Management (4) III. Logan
Lecture—4 hours. Prerequisite: course 100A; Statistics 103. Application of economic theory and quantitative methods in analyzing production management problems including inventory control, production scheduling, quality control, simulation, systems approach, and work measurement.

169. Economics of Energy (3) II. Wilen
Lecture—3 hours. Prerequisite: course 100B (or Economics 100) or consent of instructor. Course designed to familiarize students with economic concepts necessary to study energy issues. Topics covered include: petroleum economics, cartel behavior, exploration and development, economics of alternative energy sources, risk and uncertainty, transition to alternative sources, substitutability. (Same course as Environmental Studies 169.)

171A. Financial Management of the Firm (3) I.
Lecture—3 hours. Prerequisite: Economics 11A, 11B, and course 106. Financial analysis at the firm level: methods of depreciation; influence of the tax structure; inventory, cash, and accounts receivable management; sources of short-term and long-term financing. Students who have had or are taking Economics 134 may not receive credit for this course.

171B. Financial Management of the Firm (3) II.
Lecture—3 hours. Prerequisite: course 171A, Economics 11A, 11B. Financial analysis at the firm level; methods of capital budgeting; calculating the cost of capital; dividend policies; mergers and acquisitions; and special current topics in finance.

176. Economic Analysis in Resource Use (3) III. Gardner
Lecture—3 hours. Prerequisite: Economics 1A, 1B; course 100B or the equivalent recommended. An analytical treatment of resource use problems, including public policy issues; economic productivity and natural resources; determinants, principles and patterns of natural resource use; resource conservation; land tenure problems and policies.

180. Senior Production Economics (4) I, Paris, Olson
Lecture—3 hours; discussion—1 hour. Prerequisites: courses 100A, 106, and 155; senior standing. Risk and uncertainty as they relate to production response, investment decision, enterprise combination, machine scheduling, crop insurance and government programs. Regression analysis as well as linear and quadratic programming employed throughout the course.

190A. Senior Research Project (2) I, Snyder; II, King
Lecture—1 hour; discussion—1 hour. Prerequisite: course 100A and Statistics 103, or consent of instructor; senior standing. Individual student-defined research project conducted under faculty guidance. Problem definition, study objectives, procedure, method of analysis, working outline, and preliminary elements of report writing to be completed in the first quarter. (Deferred grading only, pending completion of sequence.)

190B. Senior Research Project (2) II, Snyder; III, King
Lecture—1 hour; discussion—1 hour. Prerequisite: course 190A or consent of instructor. The research report begun in course 190A will be completed and, after evaluation by the instructor, be revised and resubmitted by the student prior to the end of 190B. (Deferred grading only, pending completion of sequence.)

192. Internship (1-6) I, II, III, summer. The Staff (Chairperson in charge)
Laboratory—3-18 hours. Internship experienced off and on campus in all subject areas offered in the Department of Agricultural Economics. Internships are supervised by a member of the staff. (P/NP grading only.)

197T. Tutoring in Agricultural Economics (1-3) I, II, III. The Staff (Chairperson in charge)
Hours and duties will vary depending upon the course being tutored. Prerequisite: senior standing in Agricultural Economics and consent of Department Chairperson. Tutor will lead small discussion groups affiliated with one of the department's regular courses, under the supervision of, and at the option of the instructor in charge of the course. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: junior or senior standing and consent of instructor. Limited to students with adequate preparation in Agricultural Economics. (P/NP grading only.)

Graduate Courses

200A. Microeconomic Theory (5) II. Antonovitz
Lecture—4 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200M, Mathematics 16A-16B. Theories of behavior of individual economic agents. Characteristics of market equilibrium in perfectly competitive, monopolistic, and monopsonistic markets. (Same course as Economics 200A.)

200B. Microeconomic Theory (5) III. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200A or consent of instructor. Introduction to theorems of welfare economics in a general equilibrium, linear economic models, externalities and market failure, social welfare functions. (Same course as Economics 200B.)

200C. Microeconomic Theory (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 200A, 200B. Further topics in microeconomics, including risk and uncertainty, capital theory, separability and aggregation, and other topics. (Same course as Economics 200C.)

200M. Optimization in Economics (5) I. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: Economics 100 or 100M, 101; Mathematics 21A-21B. Techniques of optimization for economic analysis; linear algebra, applications to systems of linear equations; multivariate analysis; linear and nonlinear programming, Kuhn-Tucker Theorem. (Same course as Economics 200M.)

204. Microeconomic Analysis (5) I, Dynarski (Economics)
Lecture—4 hours; discussion—1 hour. Prerequisite: Economics 100 or courses 100A-100B and Mathematics 16A-16B; open to advanced undergraduates with consent of instructor. Economic reasoning and social choice: behavior of firms and households, theory of markets, partial and general equilibrium analysis, welfare economics, illustrations and applications. (Same course as Economics 204.)

***206. Applied Welfare Economics** (3) II.
Lecture—3 hours. Prerequisite: one graduate course in microeconomic theory; one course in econometrics (co-requisite); one intermediate course in welfare economics (Economics 130). Application of welfare economic theory to topics chosen from areas of human resources, natural resources, general welfare issues, and market performance. Focus on the techniques of welfare theory by illustrating alternative methodologies through specific empirical applications.

215A. Economic Development (4) I, Kaneda (Economics)
Discussion—1 hour; seminar—3 hours. Prerequisite: Bachelor's degree in Economics (or the equivalent) or consent of instructor. Theories of economic development as they relate to developing nations; demographic problems; distribution issues in economic development. (Same course as Economics 215A.)

215B. Macroeconomic Development (4) II. Jarvis
Discussion—1 hour; seminar—3 hours. Prerequisite: course 215A. The macroeconomics of economic development; monetary policy problems; fiscal problems, international trade; specific country studies. (Same course as Economics 215B.)

215C. Economic Development in Agriculture: Policy and Planning (4) III. Hansen
Lecture—3 hours; discussion—1 hour. Prerequisite: course 215A or the equivalent. Agriculture in the structure of developing nations; its role in economic development; agriculture and national planning; sectorial policies relating to prices, inputs, productivity, and marketing; international aspects of trade, aid, and technical assistance; country case studies. (Same course as Economics 215C.)

215D. Development Programming (4) III. Kaneda (Economics)
Discussion—1 hour; seminar—3 hours. Prerequisite: courses 215A and 215B or 215C, 200B, Economics 200E. Analysis of development plans, programs and policies. Application of input-output, programming, and operations research. Techniques of project evaluation. (Same course as Economics 215D.)

221. Agricultural Policy in Developed Countries (3) I, Carter
Lecture—3 hours. Economic policy, its nature, formation and analysis; characteristics of agricultural sectors in developed countries; comparative analysis of policies relating to production, marketing, price, income, rural poverty, and resource adjustment; international trade policies for temperate zone agricultural commodities.

240A. Econometric Methods (4) III. Green
Lecture—4 hours. Prerequisite: Statistics 130B and a course in linear algebra. Statistical models and their use in estimation of economic relationships; single and multiple equation systems. (Same course as Economics 240A.)

240B. Advanced Econometrics: Theory (4) I, Havenner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A; Statistics 131A, 131B, 131C recommended. Multivariate analysis, specification analysis, simultaneous equation models, identification, estimating methods, small sample properties. (Same course as Economics 240B.)

240C. Advanced Econometrics: Application (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A. Time series analysis and distributed lags, pooling of time series and cross-section data, Bayesian analysis, applications for prediction and policy. (Same course as Economics 240C.)

252. Applied Linear Programming (4) I, Paris
Lecture—3 hours; discussion—1 hour. Applied linear programming methods emphasizing uses for business decisions: production, diet, blending, network and related problems.

253. Optimization Techniques with Economic Applications (4) II. Howitt
Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200M. Optimization techniques and methods including linear and nonlinear programming and dynamic models. Numerical applications to household, firm, general equilibrium and economic growth problems.

254. Dynamic Optimization Techniques for Economic Systems with Applications (4) II. Havenner
Lecture—4 hours. Prerequisite: course 253. Dynamic programming, Pontryagin maximum principle, and optimal control problem. Emphasis on methods with selected applications to economic problems.

255. Systems Analysis and Simulation (3) III. Logan
Lecture—3 hours. Dynamic model formulation and computer simulation of economic systems.

256. Applied Econometrics (4) II. Heien
Lecture—3 hours; discussion—1 hour. Application of statistical tools to economic and business analysis. Emphasis on regression analysis, problems of specification, and model development.

257. Production Planning and Market Analysis (3) III.
Lecture—3 hours. Quantitative analysis of production systems by statistical, economic, and engineering methods; sales analysis for the individual firm; problems of investment, location, scale of operations.

261. Case Problems in Management (3) III. McCorkle
Lecture—1 hour, discussion—2 hours. Case problem analysis and discussion of business policy and strategy including organization, planning, production, marketing, and financing issues. Emphasis is on problem definition and solution using current examples drawn primarily from agriculturally oriented firms.

263. Agricultural Firm Analysis (3) III. McCorkle
Lecture—1½ hours; discussion—1 hour; summer field trips—one 5-day, and one 5-hour. Prerequisite: graduate standing in Agricultural Economics. Review and analysis of production, marketing, and resource issues facing agricultural firms in California. Application of production, economic theory and measurement to individual firm decisions in an applied setting.

NOTE: For key to footnote symbols, see page 123.

271. Financial Management (3) III. Sosnick
Lecture—3 hours. Prerequisite: course 171B or the equivalent. Sources and costs of capital, optimal capital structure; project evaluation, investment policy, risk management, dividend policy, management of working capital; mergers and reorganizations.

280. Analysis of Research in Production Economics (4) I, Antle
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) I, 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. Howitt
Lecture—3 hours. Scope and disciplinary context of natural resource economics. Recent problems affecting policy and use planning including efficiency and welfare criteria, technological externalities, public goods, extra market goods, indivisibilities, and intertemporal problems, benefit cost analysis and public and private investment criteria.

290. Introduction to Research in Agricultural Economics (1) I, Gardner
Seminar—1 hour. Prerequisite: graduate standing in Agricultural Economics. Seminar to familiarize entering students with research issues, research applications, research methodology, information sources and problem identification. Focus is on underlying motivations, usefulness and scope of agricultural economics research. (S/U grading only.)

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Advanced study through special seminars, informal group studies, or group research on problems for analysis and experimentation. Sections: (1) Managerial Economics; (2) Agricultural Policy; (3) Community and Regional Development; (4) Natural Resources; (5) Human Resources; (6) Research Methods and Quantitative Analysis.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
Sections: (1) Managerial Economics; (2) Agricultural Policy; (3) Community and Regional Development; (4) Natural Resources; (5) Human Resources; (6) Research Methods and Quantitative Analysis; and (7) Dissertation Research Prospectus. (S/U grading only.)

299D. Special Study for Doctoral Dissertation (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Agricultural Education

See Agricultural Education (below); and Agricultural and Home Economics Education

Agricultural Education

(College of Agricultural and Environmental Sciences)

The Major Program

The Agricultural Education major serves those interested in teaching agricultural sciences in high schools or community 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, or 1A-1B)	6
Depth Subject Matter	**67**
Agricultural economics	9
Agricultural and Home Economics Education 100, 160, 300	7
Agricultural engineering	11
Animal sciences	16
Environmental sciences (includes offerings in environmental horticulture, environmental studies, environmental toxicology, renewable natural resources, and wildlife and fisheries biology)	8
Plant and soil sciences	16
Breadth Subject Matter	**33**
English (see College requirement, page 71; plus 4 additional units of English or rhetoric).	12
Economics 1A or 1B	5
Social sciences and humanities electives †	16
Restricted Electives to supplement or expand any of the above areas. Choose from the following: Entomology 110; Environmental Planning and Management 20; Nutrition 103; Plant Pathology 120; Water Science 110, 111.	14
Unrestricted Electives	**24**
Total Units for the Major	**180**

Major Adviser. J. G. Leising *(Applied Behavioral Sciences).*

Advising Center for the major is located in Academic Office Building 4 (752-2244).

Teaching Credential Subject Representative. You may make an appointment with a credential counselor and obtain a statement of the complete requirements for the credential at the Applied Behavioral Sciences departmental office, 106 Academic Office Building–4. Since many majors in the College do not offer the minimum preparation necessary for entering the Agriculture Credential program, you are encouraged to seek counseling as early as possible. See also page 98 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 94. Further information may be obtained from the department and the *Graduate Announcement.*

Graduate Adviser. M. C. Regan.

Courses. See course listings under Agricultural and Home Economics Education (page 127) and Applied Behavioral Sciences (page 141).

†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 123.

Agricultural Engineering

(College of Agricultural and Environmental Sciences)
Roger E. Garrett, Ph.D., Chairperson of the Department
Department Office, 2030 Bainer Hall (752-0102)

Faculty

Norman B. Akesson, M.S., Professor
Roy Bainer, M.S., LL.D., Professor Emeritus
William J. Chancellor, Ph.D., Professor
Pictiaw (Paul) Chen, Ph.D., Professor
Roger E. Garrett, Ph.D., Professor
John R. Goss, M.S., Professor
George F. Hanna, M.Ed., Lecturer Emeritus
S. Milton Henderson, M.S., Sc.D., Professor Emeritus
David J. Hills, Ph.D., Associate Professor
Bryan M. Jenkins, Ph.D., Assistant Professor
M. Stephen Kaminaka, Ph.D., Assistant Professor
Robert A. Kepner, B.S., Professor Emeritus
Coby Lorenzen, Jr., M.S., Professor Emeritus
James J. Mehlschau, B.S., Senior Adjunct Lecturer
John A. Miles, Ph.D., Associate Professor
Stanton R. Morrison, Ph.D., Professor
Loren W. Neubauer, Ph.D., Professor Emeritus
Michael O'Brien, Ph.D., Professor
Hugo Patiño, Ph.D., Assistant Professor
Thomas R. Rumsey, Ph.D., Associate Professor
R. Paul Singh, Ph.D., Professor
Henry E. Studer, M.S., Professor
Shrinivasa K. Upadhyaya, Ph.D., Assistant Professor
Wesley E. Yates, M.S., Professor

Courses. See course listings under Agricultural Engineering Technology (this page), Consumer Technology (page 166), and Engineering: Agricultural (page 187).

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 program see the major in Engineering: Agricultural and specializations (page 180); and see page 94 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 187. Questions pertaining to the following courses should be directed to the instructor or to the Department Office, 2030 Bainer Hall.

Lower Division Courses

15. Plane Surveying (3) III. Goss
Lecture—2 hours; laboratory—3 hours. Prerequisite: plane trigonometry; Consumer Technology 31 recommended. Not open to students in Engineering. Principles of measurement of horizontal distances, horizontal and vertical angles, elevations and differential levels, including stadia methods. Field problems with special reference to agricultural, forestry and landscaping applications.

98. Directed Group Study (1-5) I, II, III. The Staff (Garrett in charge)
Prerequisite: consent of instructor. Group study of selected topics. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

Upper Division Courses

101. Fruit Production Mechanization (1) III. Studer
Lecture—1 hour; two or three field trips. Prerequisite: upper division standing, Physics 2A, and general knowledge of fruit production. The relationship of orchard, vineyard, and small-fruit machinery to fruit production and quality; functions and capabilities; interrelationships between cultural practices and machine operation. (P/NP grading only.)

102. Farm Tractors (1) II.
Lecture—1 hour. Prerequisite: Physics 2A or high school physics recommended. Types of farm trectors; operating principles, including power transmission components, power-take-off drives, implement hitches and controls; traction and drawbar power; operator safety, comfort, and convenience. (Engines are studied in Consumer Technology 101.)

103. Hydraulic Power and Controls (1) II. Studer
Lecture-laboratory—2 hours. Prerequisite: upper division standing; Physics 2A. Principles of operation and construction of hydraulic systems. Function and application of pumps, motors, and valves for controlling machines.

104. Field Machinery (2) III.
Lecture—1 hour; laboratory—3 hours. Prerequisite: upper division standing; Physics 2A and some general knowledge of field crop production recommended. Principles, performance, and operating characteristics of machines for tillage, planting, cultivating, and harvesting field and vegetable crops. Laboratory may include one or more field trips, field studies, laboratory studies of specific machines, and lecture-discussions.

105. Machinery Management (1) III. Chancellor
Lecture—1 hour. Prerequisite: course 101 or 102 or 104, or consent of instructor. Factors in machinery management decisions; sources of management information; methods of analyzing and selecting machinery systems; management of machinery maintenance; the role of machinery management with respect to worker safety.

113. Animal Environment and Shelters (1) I, Morrison
Lecture—2 hours (first five weeks of quarter). Prerequisite: Animal Science 2 or consent of instructor. Animal energetics; heat and vapor transmission in buildings; psychrometrics; ventilation; hot-weather protection. Environmental considerations affecting the choice of animal shelter.

114. Plant Shelters, Environment and Related Equipment (1) I, Morrison
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.

132. Management of Agricultural Wastes (1) II. Hills
Lecture—1 hour. Prerequisite: upper division standing; Physics 2B and Chemistry 2B recommended. Current methods of disposing of animal, plant, pesticide, food processing, and forest products wastes. Waste problems in relation to air, soil and water resources.

***132L. Laboratory Studies in Management of Agricultural Wastes** (1) III. Hills
Laboratory—3 hours. Prerequisite: course 132 (concurrently). Directed laboratory exercises, field trips and special projects to augment the study of course 132. (P/NP grading only.)

134. Pesticide Application Techniques (1) III. Yates
Lecture—1 hour. Prerequisite: upper division standing, Chemistry 1B, introductory course in environmental toxicology, and Physics 1A or 2A; introductory course in entomology, botany, plant pathology or nematology recommended. Emphasis will be on safe application of pesticides. Requirements of closed mixing and handling systems to protect workers. Disposal of pesticide materials. Selection and operation of ground and aerial spray application systems. Techniques to minimize spray drift hazards.

141. Technology for Agriculture in Developing Regions (3) I, Chancellor
Lecture—2 hours; laboratory-discussion—2 hours. Prerequisite: Physics 1A; upper division standing. Equipment used in tropical agriculture, Man-, animal-, and engine-powered devices. Energy requirements, size-scale, costs, support infrastructure development, and productivity potentials. (Same course as International Agricultural Development 141.)

141AT. Equipment Technology for Developing Agriculture (1) I, Chancellor
Autotutorial—3 hours. Prerequisite: course 141 or International Agricultural Development 141 (may be taken concurrently). Autotutorial (slide-tape) presentation of machinery, irrigation, and marine equipment technology applications, operation, and maintenance. (P/NP grading only.)

151. Energy Relations in Agricultural Production (1) II.
Lecture—1 hour. Prerequisite: Physics 2B. Quantitative relationships among energy flows in various forms through agricultural production and processing as practiced in California today; the sun, plants, animals, fertilizers, irrigation, field machinery, pesticides, transportation, food preservation, distribution.

152. Alternative Energy Applications in Agriculture (2) II. Goss, Hills, Rumsey
Lecture—2 hours. Prerequsite: Chemistry 1B and Physics 2B recommended. Alternate energy technology for: solar radiation; energy production from biomass by anaerobic digestion, fermentation and gasification; utilization of methane, ethanol, and producer gas from these processes. Practical systems for collecting, converting, storing, and using the energy for agricultural purposes.

161A. Fundamentals of Aquacultural Engineering (3) II.
Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 and Mathematics 16B, or the equivalent. Application of engineering principles to aquaculture; physical-chemical aspects of aquatic environment; unit processes in aquaculture; fluid flow.

161B. Fundamentals of Aquacultural Engineering (3) III.
Lecture—2 hours; discussion—1 hour. Prerequisite: course 161A. Aquaculture system planning; techniques of large-scale algal culture; introduction to mathematical modeling of aquaculture systems.

192. Internship in Agricultural Engineering Technology (1-5) I, II, III. The Staff (Garrett in charge)
Work-learn experience—3-15 hours. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work-learn experience in agricultural engineering technology. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

Graduate Courses

233. Agricultural Chemical Application Technology (3) III. Yates
Lecture-2 hours; laboratory—3 hours. Prerequisite: Plant Protection and Pest Management 202A. Principles and theory of safe and efficient application of pesticides by aerial and terrestrial equipment. Theory, design, selection and operation of nozzles, pumps, and spray systems. Selection of application techniques to minimize spray drift. Closed systems for safe mixing and loading of toxic chemicals.

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 (2) II. O'Brien
Lecture—1 hour; laboratory—3 hours. Prerequisite: a course in physics, minimum of 6 units in general area of farm mechanics; acceptance into Teacher Preparation Program in Agriculture. Practice and demonstrations in methods of teaching farm mechanics in secondary schools. Shop planning for teaching including selection arrangement and management of tools and equipment and teaching materials and safety instruction.

Agricultural Practices

(College of Agricultural and Environmental Sciences)

Courses in Agricultural Practices

Questions pertaining to the following courses should be directed to the instructor or to the Office of the Department of Agricultural Engineering, 2030 Bainer Hall.

Lower Division Courses

49A. Field Equipment Operation (1) I, III.
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.
Laboratory—3 hours. Prerequisite: consent of instructor. Theory of operation and maintenance principles for internal combustion engines, power trains, hydraulic and pneumatic controls. Introduction to arc and acetylene welding, the care and use of basic hand and shop tools. (P/NP grading only.)

Agricultural Science and Management

(College of Agricultural and Environmental Sciences)

The Major Program

The Agricultural Science and Management major is designed to prepare students for career opportunities on farms and ranches, in land management, and in agricultural service industries. The program provides a core of science and technology necessary for the understanding of how agricultural and food systems work, along with basic elements of economics, business, and management. Students may select from among several options allowing concentration of their agricultural science and technology courses in a chosen field. Experience in computing sciences serves as an appropriate complement to this major.

Agricultural Science and Management

B.S. Major Requirements:

For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal courses are acceptable; and a more comprehensive course treatment (e.g., Physics 1A, and 1B rather than 1A only) will be useful for some. Students should consider using some portion of their unrestricted elective units to go beyond the *Minimum* requirements shown for the Preparatory and Depth Subject Matter areas.

	UNITS
Preparatory Subject Matter	**53-59**
General biological sciences (Biological Sciences 1, plus: for Animal Science option, Zoology 2-2L and Animal Science 2; for Food Science option, two courses from Bacteriology 2-3, Botany 2 or Zoology 2-2L; for Plant Science option, Botany 2)	10-16
Physical sciences (Chemistry 1A, 1B, 8A, 8B, plus: for Animal Science option, Physics 1A; for Food Science option, Physics 2A; for Plant Science option, Physics 1A, 1B)	19
Mathematics (Mathematics 16A and Agricultural Science and Management 150)	7
Economics (Economics 1A, 1B, 11A, 11B)	17
Breadth Subject Matter	**18**
English, written, English 1 or 2	4
English, oral, Rhetoric 1, 3, or Philosophy 5	4
Social sciences and humanities†	10
Business Management	**18-21**
Agricultural Economics 100A, 140	9
Plus three courses covering three additional topics in economics and business management, such as: marketing (Agricultural Economics 113, 130, 136); finance (Agricultural Economics 117, 118, 145, 171A, 171B; business methods (Agricultural Economics 155, 157); and business organization (Agricultural Economics 18, 112)	9-12
Depth Subject Matter	**50**
Three options are offered, each with 50 units of courses. Students should	

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 123.

consult with an adviser before beginning work in one of these options to insure that the course pattern and preparatory subject matter are chosen to best suit the student's objectives. Variations on these options can be developed with the approval of the faculty adviser.

Animal Science option

Genetics 120, Animal Genetics 107 9
Nutrition 103 4
Physiology 110 5
Animal science 20
Animal Science 41; at least one course from Animal Science 114, 115, 116, 140, 160; and the balance from Animal Genetics 108, Animal Science 104, 105, 118B, 119, 123, 124, 128, 131, 133, 135, Bacteriology 177-177L, Epidemiology and Preventive Medicine 111, Nutrition 122, 123, Physiology 121, 130, 148.
Restricted electives 12
Courses to support student's objectives chosen with adviser's approval from the following or other areas: agricultural engineering technology, agronomy, plant science, range management, soil science and water science; Plant Science 2 or Agronomy 100 recommended.

Food Science option

Biochemistry 101A, 101B 6
Chemistry 1C, 5 9
Mathematics 16B 3
Physics 2B, 2C 6
Food science and technology 26
Food Science and Technology 103, 104-104L, 110A, 110B, and 10 additional units in food science and technology chosen with adviser's approval.

Plant Science option

Botany 111A, 111B; 120 or 121 9
Entomology 110 or 112 4
Genetics 120 4
Plant Pathology 120 4
Plant Science 2 4
Soil Science 100, 109 8
Water Science 110 3
Restricted electives 14
Additional courses chosen with adviser's approval from agricultural engineering technology, Agricultural Science and Management 21, and upper division courses with concentration in agronomy, environmental horticulture, plant science, pomology, vegetable crops or viticulture.

Unrestricted Electives 33-41

Total Units for the Major 180

Major Adviser. ———.

Upon entering the major, students should see the Major Adviser for assignment of a faculty adviser with expertise in the selected option.

Advising Center for the major is located in 177 Hart Hall (752-6118); and peer advising is in 181 Hart Hall.

Graduate Study. See page 94.

Courses in Agricultural Science and Management

Questions pertaining to the following courses should be directed to the instructor or to the Agricultural Science and Management Advising Center.

Lower Division Course

21. Computer Programming: FORTRAN (3) I, III. The Staff
Lecture—3 hours; laboratory—1 hour. Prerequisite: Statistics 13 or Mathematics 16A or the equivalent. Introduction to computer programming stressing the development of modular algorithms written in FORTRAN to solve quantitative agricultural problems. Not open to students who have received credit for Engineering 5 or Computer Science Engineering 8.

Upper Division Courses

150. Applied Statistics in Agricultural Sciences (4) I, Geng (Agronomy and Range Science)
Lecture—3 hours; laboratory—3 hours. Prerequisite: at least two years high school algebra and junior standing. Applications of statistical methods to the analysis and interpretation of research data in plant, animal, behavioral, food and nutritional sciences. Lectures cover concepts and basic statistical theory. Specialized laboratory sections cover procedures, data processing and interpretations.

190. Proseminar in Agricultural Science and Management (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: upper division majors or consent of instructor. Reports and discussions of current development in the agricultural industry. (P/NP grading only.)

Agronomy

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Agronomy and Range Science.

Major Program and Graduate Study. See majors in Plant Science (page 289) and Range and Wildlands Science (page 298); and page 94 for graduate study.

Related Courses. See Plant Science and Range Science.

Courses in Agronomy

Questions pertaining to the following courses should be directed to the instructor or to the Advising Center, 258 Hunt Hall.

Lower Division Courses

21. Agricultural Science and the Food Crisis (2) III. Rains
Lecture—2 hours. An interdisciplinary approach to the food issue. Lecturers will be drawn from several departments to discuss such areas as agronomy, nutrition, economics, water science, agricultural engineering, political science, and anthropology. Both agricultural and nonagricultural majors are encouraged to enroll. Offered in even-numbered years.

92. Agronomy Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience on or off campus in all subject areas pertaining to agronomy. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Principles of Agronomy (4) III. Travis
Lecture—3 hours; discussion-demonstration—1 hour. Prerequisite: a course in general botany and/or Plant Science 2 or consent of instructor. Fundamentals of field crop production and agronomic problem solving using ecological, physiological, and genetic principles.

100L. Principles of Agronomy Laboratory (1) III. Travis
Laboratory—3 hours. Prerequisite: course 100 (may be taken concurrently.) Field-oriented introduction to principles of agronomic crop production.

111. Cereal Crops of the World (4) II. Foster
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 100, 100L; Botany 2. Contribution of cereal crops to man's development; adaptation, production, utilization, and factors determining quality of wheat, oats, barley, rice, corn, and sorghum. Emphasis is on recent developments and scientific improvements.

***112. Forage Crop Ecology** (3) III. Raguse
Lecture—3 hours. Prerequisite: Botany 2 or consent of instructor. Forages as a world resource in food production. Ecological principles governing the adaptation, establishment, growth and management of perennial and annual forages, including pastures, rangelands and hay; aspects of forage quality which affect feeding value to livestock.

***112L. Forage Crop Ecology Laboratory** (1) III. Raguse
Laboratory—3 hours (includes four half-day field trips). Prerequisite: course 112. Greenhouse experiments and problem sets to supplement course 112. Field trips related to forage plant breeding, management, and utilization.

113. Fiber, Oil and Sugar Crops in a Changing World (4) I, Mikkelsen
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 100, 100L; Botany 2. Industrial crops as world resources of food, feed, fiber, and consumer goods. The relationship of crops to their physical and biotic environment; technological changes, socioeconomic and political forces that shape crop production, and utilization practices.

120. Morphology and Reproduction of Agronomic Crops (3) III. Webster
Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2 or the equivalent. Study of growth and development of crop plants with emphasis on reproductive structure and pollination, and techniques for morphological analysis.

192. Internship (1-12) I, II, III. summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience on or off campus in all subject areas pertaining to agronomy. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Agronomy (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: course to be tutored or the equivalent; upper division standing and consent of instructor. Designed for undergraduate students who desire teaching experience.Student will assist in courses under the direction of the faculty. May be repeated for credit up to a total of 5 units. Same course may not be tutored more than one time. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: 6 upper division units of agronomy. (P/NP grading only.)

Graduate Courses

205A-205B. Design, Analysis and Interpretation of Experiments (3-3) II-III. Geng, Williams
Lecture—2 hours; discussion—1-2 hours. Prerequisite: graduate standing in Plant Science; Agricultural Science and Management 150; knowledge of elementary FORTRAN or ALGOL recommended. The planning and analysis of field and laboratory experiments with emphasis on the biological interpretation of results.

221. Advanced Plant Breeding (4) III. Teuber
Lecture—3 hours; laboratory—3 hours. Prerequisite: Plant Science 113; Genetics 120 or 100B; course 205A. Philosophy, methods and problems in developing improved plant species. Topics include: inbreeding, heterosis, progeny testing, breeding methodology, index selection, germplasm conservation, and breeding for pest and stress resistance. Discussions focus on population improvement methods and crop ideotype.

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, Qualset
Lecture—2 hours; discussion—1 hour. Prerequisite: course 222 or consent of instructors. Theory and application of selection to plant populations for improvement of quantitative characters. Statistical genetic analysis of quantitative character expression and methods for obtaining maximum efficiency in plant breeding schemes. Offered in odd-numbered years.

224. Chromosome Evolution (3) I, Dvorak
Lecture—3 hours. Prerequisite: Genetics 100A-100B or 120 or consent of instructor. Structure and function of chromosomes. Dynamics of their evolution at the molecular and structural levels. Offered in odd-numbered years.

225. Manipulation of Plant Chromosomes (3) I, Dvorak
Lecture—2 hours, laboratory—3 hours. Prerequisite: Genetics 100A, 100B or Genetics 120. Application of chromosome manipulation in plant genetics and plant physiology. Development and utilization of genetic tools in gene mapping, analysis of genetic architecture of plant genomes, and interspecific gene transfer. Offered in even-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.

NOTE: For key to footnote symbols, see page 123.

***231. Advanced Topics in the Ecology of Crop and Range Plant Communities** (3) II. The Staff
Lecture—3 hours. Prerequisite: Plant Science 101. Analysis and quantitative description of the structure and dynamics of field crop and range communities in relation to interplant competition, population functions, environmental stresses and adaptation.

232. Advanced Topics in the Physiology of Crop and Range Plants (3) III. Huffaker
Lecture—3 hours. Prerequisite: Botany 111B or Plant Science 102. Physiological aspects of vegetative and reproductive growth of field crop and range plants in relation to nitrogen utilization and photosynthesis.

233. Biological Nitrogen Fixation (3) III. Valentine
Lecture—2 hours; seminar—1 hour. Current concepts of the physiology, microbiology, biochemistry, genetics, and regulation of freeliving and symbiotic N_2-fixing organisms. Integration and translation of basic research to develop strategies for improving N-productivity of agronomic crops. Offered in odd-numbered years.

290. Seminar in Crop Growth, Production and Utilization (1-2) I, Huffaker; II, Mikkelsen
Seminar—1-2 hours. Topics of current interest related to plant growth processes, production and management systems, and utilization of cultivated food, feed and fiber crops.

291. Seminar in Plant Breeding and Evolution of Cultivated Plants (1-2) I, Rutger; III, Dvorak
Seminar—1-2 hours. Topics of current interest related to plant breeding systems and the origins of evolution of cultivated plants.

297T. Tutoring in Agronomy (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing; consent of instructor; and course to be tutored or the equivalent. Designed for graduate students who desire teaching experience but are not teaching assistants. May be repeated for a total of 5 units. Same course may not be tutored more than one time. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson 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 (Chairperson 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)

D. William Rains, Ph.D., Chairperson of the Department

Department Office, 133 Hunt Hall (752-1703)

Faculty

Robert W. Allard, Ph.D., Professor *(Agronomy and Range Science, Genetics)*
R. William Breidenbach, Ph.D., Lecturer
Ivan W. Buddenhagen, Ph.D., Visiting Professor
John P. Conrad, Ph.D., Professor Emeritus
Beecher Crampton, M.S., Senior Lecturer
Montague W. Demment, Ph.D., Assistant Professor
Jan Dvorak, Ph.D., Associate Professor
Ken W. Foster, Ph.D., Assistant Professor
Shu Geng, Ph.D., Professor
Melvin R. George, Ph.D., Adjunct Lecturer
James E. Hill, Ph.D., Adjunct Lecturer
F. Jack Hills, Ph.D., Adjunct Lecturer
Ray C. Huffaker, Ph.D., Professor
Leland F. Jackson, Ph.D., Adjunct Lecturer
Subodh K. Jain, Ph.D., Professor
Milton B. Jones, Ph.D., Lecturer
Burgess L. Kay, B.S., Lecturer
Thomas A. Kerby, Ph.D., Adjunct Lecturer
Paulden F. Knowles, Ph.D., Professor Emeritus
Horton M. Laude, Ph.D., Professor Emeritus
William M. Longhurst, Ph.D., Professor Emeritus
Robert S. Loomis, Ph.D., Professor
R. Merton Love, Ph.D., Professor Emeritus
John W. Menke, Ph.D., Associate Professor
Duane S. Mikkelsen, Ph.D., Professor
Maurice L. Peterson, Ph.D., Professor Emeritus
Donald A. Phillips, Ph.D., Professor
Calvin O. Qualset, Ph.D., Professor
Charles A. Raguse, Ph.D., Professor
D. William Rains, Ph.D., Professor
J. Neil Rutger, Ph.D., Adjunct Professor
Charles W. Schaller, Ph.D., Professor
Ernest H. Stanford, Ph.D., Professor Emeritus
Larry R. Teuber, Ph.D., Associate Professor
Robert L. Travis, Ph.D., Professor
Carl L. Tucker, M.S., Adjunct Lecturer
Raymond C. Valentine, Ph.D., Professor
Barbara D. Webster, Ph.D., Professor
William A. Williams, Ph.D., Professor
Frederick P. Zscheile, Jr., Ph.D., Professor Emeritus

Courses. See course listings for Agronomy (page 132) and Range Science (page 299).

American Studies

(College of Letters and Science)

Jay Mechling, Ph.D., Program Director

Program Office, 816 Sproul Hall (752-3377)

Committee in Charge

Daniel H. Calhoun, Ph.D. *(History)*
[2,3]Dennis J. Dingemans, Ph.D. *(Geography)*
Bruce Hackett, Ph.D. *(Sociology)*, Chairperson
Harvey Himelfarb, M.A. *(Art Studio)*
[4]Stephen C. Jett, Ph.D. *(Geography)*
Michael P. Kramer, Ph.D. *(English)*
C. Roland Marchand, Ph.D. *(History)*
Jay Mechling, Ph.D. *(American Studies)*
Gerald P. Mohrmann, Ph.D. *(Rhetoric)*
Robert K. Sarlós, Ph.D. *(Dramatic Art)*
Robert Sommer, Ph.D. *(Psychology)*
David Scofield Wilson, Ph.D. *(American Studies)*

Faculty

Jay Mechling, Ph.D., Associate Professor
David Scofield Wilson, Ph.D., Associate Professor

The Major Program

Students who choose the American Studies major are usually those who feel too limited by a departmental approach to American experience. American Studies lower division courses are an introduction to interdisciplinary study through attention to significant cultural themes, such as science and technology, gender images, or nature. American Studies features close contact between students and instructors, special attention to student writing, and the combination of classroom and field work.

The major program offers the advanced student of American civilization some strategies for combining disciplines with the aim of describing and interpreting American cultural systems. The *American Studies Core* courses provide the student the opportunity to conduct original research in the company of interdisciplinary teachers and students. The *Interpretive Skills Core* equips students with the methods and techniques they will need in order to get the most out of their other upper-division coursework for the major and to be able to undertake the senior research project that culminates the student's program of study. These skills include fieldwork techniques in natural cultural settings, principles and practice of the criticism of verbal materials, and principles and practice of the criticism of visual materials. The student also plans an upper-division emphasis in close consultation with an American Studies adviser, and undertakes a senior research project.

Career Alternatives. As an interdisciplinary program, American Studies provides a good liberal arts and sciences undergraduate education. American Studies maximizes the student's contact with a variety of subject matter and approaches. This flexibility has meant that graduates have been able to move into a broad range of career settings, including journalism, law, medicine, nursing, law enforcement, environmental planning, teaching, library science, museum curatorship, and business. Some students discover new career possibilities through their internships in American institutions.

American Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**18**
One course from American Studies 1 series	4
American Studies 30	2
American Studies 45	4
Two courses chosen from History 17A, 17B, 72A, 72B	8
Depth Subject Matter	**48**
American Studies core courses: American Studies 120, 140A, 140B, 190A-190B	20
Interpretive Skills core courses: (a) Fieldwork: American Studies 111 (Sacramento Valley Studies) (b) Criticism: Verbal, choose one course from Comparative Literature 141 (literary theory and criticism), English 110A (introduction to principles of criticism), Rhetoric 120 (rhetorical criticism) (c) Criticism: Visual, choose one course from Art 147 (theory and criticism of photography), Art 148 (theory and criticism of painting and sculpture), Art 149 (theory and criticism of architecture), Rhetoric 143 (media criticism: broadcast)	12
Emphasis: In consultation with an American Studies adviser, the student designs a program of 16 units of upper division coursework around a unifying theme or subject matter in American civilization. The coursework should come from at least two disciplines.	16
Total Units for the Major	**66**

Recommended
Completion of the College requirement in English composition before enrollment in American Studies 190A.

Minor Program Requirements:

	UNITS
American Studies	**20**
American Studies, upper division courses: No more than 8 units of course 192 may be counted toward this total.	20

Faculty Advisers. J. Mechling, D. S. Wilson.

Teaching Credential Subject Representative. J. Mechling. See page 98 for the Teacher Education Program.

NOTE: For key to footnote symbols, see page 123.

Courses in American Studies

Lower Division Courses

1A. Technology, Science and American Culture (4) I, 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. Religion in American Lives (4) III. Wilson
Lecture—2 hours; discussion—1 hour; tutorials and filed exercises. Examines ways Americans have ordered their lives with religion; how later-day churches, imported faiths, and Indian cultures differ or converge; attention to "civil religion" and mass-media evangelism; genres of religious experience, such as testimony, song, dance, ritual, meditation, vision, trance.

1E. Nature and Culture in America (4) III. 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) II. The Staff
Lecture—2 hours; discussion—1 hour; directed analysis of popular media. Lecture; media exposure; special projects. Examines the image of women as presented in popular media. Emphasis on the politics of gender roles and the connection between the popular feminine image and the demands of the larger American culture.

2. Forms of American Wisdom (2) II, III. Mechling, Wilson
Lecture—1 hour; discussion—1 hour. 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.)

10. American Civilization (4) I, III. Mechling, Wilson
Lecture—2 hours; discussion—2 hours. Intended for student not specializing in American Studies. Interpretation of American society and culture from a variety of perspectives. Examples from American landscape, building, ritual, folklore, literature, and art.

30. Fieldwork in American Civilization (2) I, III. The Staff
Lecture—1 hour; discussion—1 hour. A practical introduction to the multi-disciplinary techniques of gathering, organizing, and interpreting the data of American experience; exercises in participant observation, interviewing, above-ground archaeology, photographic anthropology, and in the application of these techniques to the study of a literate, post-industrial civilization.

45. Introduction to American Studies (4) III. Mechling, 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 Undergreduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

101A-H. Special Topics (4) I, II, III. The Staff (Chairperson in charge)
Seminar—3 hours, intensive reading, writing, and special projects. Interdisciplinary group study of special topics in American Culture Studies, designed for non-majors as well as majors. Content will vary according to the instructor and in accord with the following titles: **(A)** Popular Culture Studies; **(B)** Women's Studies; **(C)** Material Aspects of American Culture; **(D)** American National Character; **(E)** American Lives Through Autobiography; **(F)** The Interrelationship Between Arts and Ideas; **(G)** New Directions in American Culture Studies; **(H)** Problems in Cross-Cultural American Studies. May be repeated for credit in different subject area only.

111. Sacramento Valley Studies (4) II. Wilson
Lecture—2 hours; discussion—1 hour; fieldwork. Prerequisite: course 1 or 45 or Anthropology 2 recommended, or consent of instructor. A comparative study of the American cultures in the Sacramento River Valley, including their relationship to a shared biological, physical, social environment, their intercultural relations, and their relationships to the dominant American culture.

120. American Folklore and Folklife (4) II. Mechling
Lecture—3 hours; fieldwork—1 hour. The theory and method of the study of American folk traditions, including oral lore, customs, music, and material folk culture (arts, crafts, architecture, costume, food). Emphasis upon the collection, classification, and analysis of California and urban folk traditions.

125. Corporate Cultures (4) III. Hagerty
Lecture—2 hours; discussion—1 hour; fieldwork—1 hour. Prerequisite: one course chosen from course 30, 120, Anthropology 2, Psychology 16, or Sociology 1; or consent of instructor. Exploration of the small group cultures of American corporate workplaces, including the roll of environment, stories, jokes, rituals, ceremonies, personal style, and play. The effects of cultural diversity upon corporate cultures, both from within and in contact with foreign corporations.

140A. American Studies and the Social Sciences (4) II. Mechling
Lecture-discussion—3 hours; term paper. Prerequisite: courses 1 and 45. Exploration of convergent ways American Studies scholars use languages of the social sciences to explore American events, institutions, values, and meanings.

140B. American Studies and the Humanities (4) III. Wilson
Lecture-discussion—3 hours; term paper. Prerequisite: courses 1 and 45. Exploration of convergent ways American Studies scholars use languages of the humanities to explore American events, institutions, values, and meanings.

190A-190B. Senior Proseminar (4-4) I-II. Wilson, Mechling
Seminar—2 hours; project—2 hours. Prerequisite: senior standing in American Studies major. Individual conferences and written reports. Individual research on American Studies topics. (Deferred grading only, pending completion of sequence.)

192. Internship in American Institutions (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: enrollment dependent on availability of intern positions, with priority to American Studies majors and those completing course 30. Supervised internship and study within and about key organizations in American civilization at archives, museums, schools, historical societies, governmental and social agencies, etc., with attention to the techniques of participant observation and the collection of ethnographical data. May be repeated for credit for a total of 12 units. (P/NP grading only.)

197T. Tutoring in American Studies (1-5) I, II, III. The Staff (Chairperson in charge)
Tutorial—1-5 hours. Prerequisite: consent of Chairperson of American Studies Program. Tutoring in lower division American Studies courses, usually in small discussion groups. Periodic meetings with the instructor in charge; reports and readings. May be repeated for credit when the tutoring is for a different course. (P/NP grading only.)

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

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

Graduate Courses

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Anatomy

See Anatomy (this page); and Human Anatomy (under Medicine, School of)

Anatomy

(School of Veterinary Medicine)

Charles G. Plopper, Ph.D., Chairperson of the Department

Department Office, 1321 Haring Hall (752-1174)

Faculty

George H. Cardinet III, D.V.M., Ph.D., Professor
Leslie J. Faulkin, Jr., Ph.D., Associate Professor
Dallas M. Hyde, Ph.D., Associate Professor
Ralph L. Kitchell, D.V.M., Ph.D., Professor
Carleton L. Lohse, D.V.M., Ph.D., Associate Professor
Charles G. Plopper, Ph.D., Associate Professor
Walter S. Tyler, D.V.M., Ph.D., Professor

Courses in Anatomy

Upper Division Courses

100. Systematic Anatomy (4) I, Cardinet
Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2, 2L. Lectures, dissections, and demonstrations emphasizing the typical structure of the anatomical systems of the dog, chicken, and subhuman primate.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
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. The Staff
Lecture—2 hours; laboratory—9 hours. Prerequisite: course 100 or consent of instructor. Detailed dissections comparing the anatomy of the dog, sheep, chicken and primate. Emphasis placed on the unique aspects of each species and their use in research.

202. Organology (2) II. The Staff
Lecture—2 hours. Prerequisite: course 100 or the equivalent and consent of instructor. Comparative development, growth patterns, and composition of selected organs: liver, kidney, lung, mammary gland, brain, and a skeletal muscle. Offered in even-numbered years.

205. Ultramicroscopic Anatomy (3) I. The Staff (Tyler in charge)
Lecture—3 hours. Prerequisite: histology. The electron microscopic appearance of cells, tissues, and organs of animals emphasizing the structural basis for their physiological functions. Offered in even-numbered years.

207. Perspectives in Morphological Research (3) III. The Staff (Tyler in charge)
Lecture—2 hours; discussion—1 hour. Consideration of the principles and applications of modern morphological methods and their role in biomedical research. Examples of specific methods include sterology, computer analysis of images, scanning and transmission electron microscopy, histochemistry, autoradiography, rapid freezing, and vascular injections. Offered in odd-numbered years.

215. Veterinary Histology (6) II. The Staff (Faulkin in charge)
Lecture—3 hours; laboratory—9 hours. Prerequisite: Zoology 2-2L. The microscopic anatomy of tissues and organs of mammalian and avian species of veterinary significance.

283. Tumor Biology (3) I, Faulkin, Cardiff, Benjamini, Goldman, Manning, Theilen, Troy
Lecture—3 hours. Prerequisite: graduate standing and consent of instructor. Growth, invasion and metastasis of tumors; mechanisms of carcinogenesis; intrinsic and extrinsic etiologic factors. Offered in odd-numbered years.

290. Seminar (1) I. The Staff
Seminar—1 hour. (S/U grading only.)

297. Advanced Group Study in Surgical Anatomy (2-4) I, II, III. Lohse
Laboratory—6-12 hours. Prerequisite: Veterinary Medicine 407C or consent of instructor. Selected topics in topographical, radiological, or regional anatomy as they apply to the clinical sciences.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Laboratory—6-15 hours. Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—6-36 hours. Prerequisite: consent of instructor. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

Anatomy (A Graduate Group)

———, Ph.D., Chairperson of the Group

Group Office, 1321 Haring Hall (752-3082)

Faculty. Includes faculty members from the Schools of Medicine and Veterinary Medicine as well as from various departments such as Avian Sciences, Environmental Toxicology, Nutrition, Physical Education, and Zoology.

Graduate Study. The Graduate Group in Anatomy offers graduate study leading to the M.S. and Ph.D. degrees. It is designed to provide fundamental training in those basic subject areas required of a teacher as well as specialized training in one of the areas of anatomy which would be pursued by a research scientist. The interrelationship between structure and function is stressed. Areas of specialization include cell structure and function, neuromorphology, reproduction and developmental anatomy, and individualized areas of specialization. Applications to the study programs are considered only twice a year, January 15 and June 1.

Preparation. Applicants for graduate work must have courses in general biology and chemistry, systemic physiology, morphology, biochemistry or cell biology, and statistics. After students have been admitted to the program, course work will be in such areas as gross anatomy of man or animals, microscopic anatomy, electron-microscopic anatomy, embryology, and systemic physiology.

Graduate Adviser. A. G. Hendrickx *(Human Anatomy)*, D.M. Hyde *(Anatomy)*.

Anesthesiology

See Medicine, School of

Animal Behavior (A Graduate Group)

Robert M. Murphey, Ph.D., Chairperson of the Group

Group Office, 148 Young Hall (Psychology) (752-1880/1673)

Faculty

The Group includes faculty from eight departments in three schools and colleges.

Graduate Study. The Ph.D. program in Animal Behavior is an interdepartmental program which trains students for teaching and research in a variety of areas including psychology, zoology, animal science, veterinary science, ecology, and wildlife biology. Students choose one of the three areas of specialization: (1) ethology and the evolutionary basis of animal behavior, (2) physiological basis of animal behavior, and (3) behavior of domestic animals. All three specializations will emphasize the adaptive and evolutionary basis of animal behavior. Resources available to students, in addition to various departmental facilities, include those of the California Primate Research Center and the Agricultural Field Stations.

There is an early application deadline of February 15 for Fall Quarter.

Preparation. Appropriate preparation is a bachelor's or master's degree in one of the several disciplines relevant to behavior such as psychology, zoology, anthropology, physiology, wildlife biology, ecology, animal science, veterinary science, genetics, or animal behavior. In addition, at least one course from each of the following four areas must be taken before admission into the program or before the end of the first year in the program.

General genetics: Genetics 100A-100B or 120, or the equivalent

Statistics: Statistics 102 or Psychology 103, or the equivalent

Evolution: Genetics 103 or Zoology 148, or the equivalent

Animal behavior: Psychology 150, Wildlife and Fisheries Biology 140, or Zoology 155, or the equivalent

Students are encouraged to engage in some form of research as early as possible during the first year. This predissertation research may be pursued under the guidance of any faculty member of the Group, not necessarily the student's major professor.

Breadth Requirement. The following core courses or the equivalent (22 to 24 units) are required of all students.

Systemic physiology: Physiology 110 or Zoology 142

Statistical analysis: Psychology 206 or Statistics 106

Scientific approaches to animal behavior research: Animal Behavior 201

Seminar in animal behavior: Animal Behavior 290

Ecology: Entomology 104, Environmental Studies 100, or Zoology 125

College teaching: Biological Sciences 210 or Psychology 390

Comparative psychology: Psychology 250

Specialization. In addition to the requirements listed above, students must also take several courses in one of the three areas of specialization with substitution as approved by the adviser.

Graduate Adviser. R. G. Coss (Psychology).

Courses in Animal Behavior

Graduate Courses

201. Scientific Approaches to Animal Behavior Research (3) I, Lott (Wildlife and Fisheries Biology)
Lecture—3 hours. Prerequisite: consent of instructor. Philosophical issues, goals, strategies and tools in field and laboratory research. May be repeated for credit when the topic is different.

***220. Behavioral Aspects of Animal Domestication** (3) III. Price (Animal Science) in charge, Hart (Physiological Sciences)
Lecture—3 hours. Prerequisite: graduate standing and a course in animal behavior or consent of instructors. History of animal domestication, the role of natural and artificial selection in domestication, the influence of environment and experience on domestic animal behavior and human-animal interrelations. Offered in even-numbered years.

290. Seminar in Animal Behavior (1-3) III. The Staff (Chairperson in charge)
Seminar—1-3 hours. Prerequisite: consent of instructor. Selected topics in animal behavior. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing or consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. Advanced research in one of the specialty areas in animal behavior. (S/U grading only.)

Animal Biochemistry

See Biochemistry; and Biochemistry and Biophysics

Animal Genetics

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Animal Science.

Major Program. See major in Genetics (page 218).

Related Courses. See Agronomy 221, 222, 223; Plant Pathology 215; Plant Science 113; Vegetable Crops 220.

Courses in Animal Genetics

Questions pertaining to the following courses should be directed to the instructor or to the Animal Science Advising Center, 177 Hart Hall.

Upper Division Courses

107. Genetics and Animal Breeding (5) I, III. Gall
Lecture—5 hours. Prerequisite: Genetics 120 or 100A-100B. Principles of quantitative genetics applied to improvement of livestock and poultry. Effects of mating systems and selection methods are emphasized with illustration from current breeding practices. Foundation provided for further study in animal breeding.

108. Methods in Quantitative Animal Breeding (3) II. Famula
Lecture—3 hours.
Prerequisite: course 107. Methods and procedures in quantitative animal breeding: repeatability, heritability and genetic correlation estimation; single and multiple trait selection methods.

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

***204. Theory of Quantitative Genetics** (3) I, Gall
Lecture—2 hours: lecture)discussion—1 hour. Prerequisite: course 107 or the equivalent. Introduce the theoretical basis of quantitative genetics and the consequences of Mendelian inheritance. The course will develop the concepts used to estimate quantitative genetic differences and basis for partitioning the phenotypic variance.

206. Advanced Domestic Animal Breeding (3) I, Famula
Lecture—3 hours. Prerequisite: course 107 and Animal Science 205; course 204 recommended. Procedures for the genetic evaluation of individuals to include selection indices and mixed model evaluation for single and multiple traits. Methods of estimating genetic trends. Offered in odd-numbered years.

207. Quantitative Genetics and Animal Breeding Theory (3) II. Abplanalp (Avian Sciences)
Lecture—2 hours: laboratory—2 hours. Prerequisite: Statistics 106 and 108 or 130A-130B. Quantitative genetic theory, relating to inbreeding and crossbreeding systems, selection for cross performance, major quantitative genes, control populations, is developed and applied to the planning of breeding programs. Offered in even-numbered years.

208. Estimation of Genetic Parameters (3) III. The Staff
Lecture—3 hours. Prerequisite: course 107 and Animal Science 205; courses 204 and 108 recommended. General methods for the estimation of components of variance and covariance and their application to the estimation of heritability, repeatability and genetic correlations are considered. Specific emphasis is given to procedures applicable to livestock populations under selection. Offered in even-numbered years.

250. Animal Improvement in an International Context (4) III. Bradford
Lecture—3 hours; seminar—1 hour. Prerequisite: completion of at least one year of graduate study, including upper

NOTE: For key to footnote symbols, see page 123.

division or graduate courses in livestock production and animal breeding. Evaluation, utilization, conservation and exchange of animal germ plasm resources; exploitation of heterosis; improvement schemes in the absence of central data processing; population structure and rate of improvement; roles of governments; group breeding schemes; research needs. (S/U grading only.) Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. The Staff (Bradford in charge) Prerequisite: consent of instructor. Lectures and discussions of advanced topics in animal genetics. (S/U grading only.)

299. Research in Animal Genetics (1-12) I, II, III. The Staff (Bradford in charge)
(S/U grading only.)

Animal Nutrition

See Nutrition

Animal Physiology

(College of Agricultural and Environmental Sciences)

John M. Horowitz, Ph.D., Chairperson of the Department

Department Office, 196 Briggs Hall (752-0203)

Faculty

R. Leland Baldwin, Ph.D., Professor *(Animal Science)*
Marylynn S. Barkley, Ph.D., Associate Professor
James M. Boda, Ph.D., Professor Emeritus
Ray E. Burger, Ph.D., Professor
Earl E. Carstens, Ph.D., Assistant Professor
Harry W. Colvin, Jr., Ph.D., Professor
Perry T. Cupps, Ph.D., Professor Emeritus *(Animal Science)*
Jack M. Goldberg, Ph.D., Associate Professor
John M. Horowitz, Jr., Ph.D., Professor
Barbara A. Horwitz, Ph.D., Professor
Frederick W. Lorenz, Ph.D., Professor Emeritus
Verne E. Mendel, Ph.D., Professor *(Animal Physiology, Animal Science)*
Gary P. Moberg, Ph.D., Professor *(Animal Science)*
Frank X. Ogasawara, Ph.D., Professor Emeritus *(Avian Sciences)*
Pamela A. Pappone, Ph.D., Assistant Professor
Edward A. Rhode, Ph.D., Professor
Robert P. Scobey, Ph.D., Associate Professor *(Neurology)*
Arnold J. Sillman, Ph.D., Associate Professor
Arthur H. Smith, Ph.D., Professor
W. Jeffrey Weidner, Ph.D., Associate Professor
Barry W. Wilson, Ph.D., Professor *(Avian Sciences)*
Charles M. Winget, Ph.D., Visiting Lecturer
Dorothy E. Woolley, Ph.D., Professor

Courses. See course listing under Physiology (Animal), page 286.

Animal Science

(College of Agricultural and Environmental Sciences)

Robert W. Touchberry, Ph.D., Chairperson of the Department

Department Office, 130 Hart Hall (752-1250)

Faculty

Thomas E. Adams, Ph.D., Assistant Professor
Gary B. Anderson, Ph.D., Professor
C. Robert Ashmore, Ph.D., Professor
R. Leland Baldwin, Jr., Ph.D., Professor
Donald L. Bath, Ph.D., Adjunct Lecturer
Patricia J. Berger, Ph.D., Assistant Professor
G. Eric Bradford, Ph.D., Professor
Dan L. Brown, Ph.D., Assistant Professor
Anthony C. Bywater, Ph.D., Associate Professor
C. Christopher Calvert, Ph.D., Assistant Professor
Floyd D. Carroll, Ph.D., Professor Emeritus
Ernest S. Chang, Ph.D., Assistant Professor
Wallis H. Clark, Jr., Ph.D., Professor
Douglas E. Conklin, Ph.D., Lecturer
Perry T. Cupps, Ph.D., Professor Emeritus
Edward J. DePeters, Ph.D., Assistant Professor
Serge Doroshov, Ph.D., Professor
J. Warren Evans, Ph.D., Professor
Thomas R. Famula, Ph.D., Assistant Professor
Graham A. E. Gall, Ph.D., Professor
William N. Garrett, Ph.D., Professor
Paul W. Gregory, Sc.D., Professor Emeritus
Dennis Hedgecock, Ph.D., Adjunct Lecturer
Ronald P. Hedrick, Ph.D., Assistant Professor
Hubert Heitman, Jr., Ph.D., Professor
J. L. Hull, M.S., Adjunct Lecturer
Silas S. O. Hung, Ph.D., Assistant Professor
Robert C. Laben, Ph.D., Professor
Yu-Bang Lee, Ph.D., Associate Professor
Glen P. Lofgreen, Ph.D., Professor Emeritus
Joan M. Macy, Ph.D., Associate Professor
Verne E. Mendel, Ph.D., Professor *(Animal Science, Animal Physiology)*
James H. Meyer, Ph.D., Professor
Gary P. Moberg, Ph.D., Professor
James G. Morris, Ph.D., Professor
Edward O. Price, Ph.D., Professor
David W. Robinson, Ph.D., Professor
Wade C. Rollins, Ph.D., Professor Emeritus
Robert W. Touchberry, Ph.D., Professor *(Sesnon Professor in Animal Science)*
Dana B. Van Liew, B.S., Adjunct Lecturer
William C. Weir, Ph.D., Professor *(Animal Science, Nutrition)*
Richard A. Zinn, Ph.D., Assistant Professor

The Major Program

The objective of the Animal Science major is to develop an understanding of the proper care of animals and their utilization by man for food, fiber, work, research, companionship and recreation. The study of animals is achieved through biologi cal, physical and social sciences such as chemistry, biochemistry, genetics, physiology, nutrition, economics, mathematics and their integration in the various animal science courses.

Career opportunities for graduates cover a wide range from farming and ranching through all of the industries, institutions and professions that serve domestic animal agriculture and aquaculture directly or indirectly. These include positions in management, sales, financial services, agricultural extension, consulting services, teaching, journalism, laboratory technology and research. Preparation for veterinary medicine or other professional schools or graduate study may be achieved by careful planning in the major.

Both aquaculture and domestic animal agriculture are included in Animal Science. Students specializing in aquaculture are advised by faculty members from this area of study.

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	**51-53**
General biological sciences: Biological Sciences 1, Zoology 2-2L, and either Bacteriology 2-3 or Botany 2	15-16
Physical sciences: Chemistry 1A, 1B, 8A, 8B; and 10 units of mathematics, including statistics	26
Animal science: Animal Science 1, 2, and 41; or 1, 2, and 24 (for Aquaculture specialty)	10-11
Depth Subject Matter	**62-64**
Physiological Sciences 101A-101B (Biochemistry 101A-101B may be substituted with consent of adviser)	6-7
Genetics: Genetics 120 or 100B, Animal Genetics 107	8-9
Nutrition (Nutrition 110 and 121; or 103 and either 122 or 123)	7
Physiology 110, 110L	7
Agricultural Engineering Technology 161A-161B (for Aquaculture specialty only)	6
Animal science, a minimum of 28 units	28
Select at least two courses from Animal Science 114, 115, 116, 119, 140, 160; and the balance from Animal Science 104, 105, 105L, 120, 123, 124, 128, 131, 133, 135; Bacteriology 177, 177L, Animal Genetics 108, Physiology 121, 121L, 130, Nutrition 122, 122L, 123, Epidemiology and Preventive Medicine 112. For the Aquaculture specialty this list is extended to include Wildlife and Fisheries Biology 120, 121, Zoology 100, 100L, 112A, 112B, 122, 122L, 142; Environmental Studies 151, 151L.	
Breadth Subject Matter	**20**
Written and oral expression (see College requirement, page 71)	8
Additional social sciences and humanities	12
Unrestricted Electives	**43-47**
Faculty advisers assist students in selecting electives according to individual interests and objectives. Chemistry 1C, Physics 2A-2B-2C, and Zoology 100-100L are recommended for graduate study preparation and completion of course requirements for application to School of Veterinary Medicine.	
Total Units for the Major	**180**

Major Adviser. E. O. Price.

Advising Center for the major is located in 177 Hart Hall (752-6118). Students must secure their academic adviser through this office upon entering the major.

Graduate Study. The Department of Animal Science offers a program of study and research leading to the M.S. degree. Detailed information may be obtained by contacting the graduate adviser. See also page 94.

Graduate Adviser. H. Heitman.

Related Courses. See Food Science and Technology 120.

Courses in Animal Science

Lower Division Courses

1. Domestic Animals and Man (4) I, Bradford
Lecture—3 hours; laboratory—3 hours. Animal domestication and factors affecting their characteristics and distribution. Animal use for food, fiber, work, drugs, research and recreation; present and future roles in society. Laboratory exercises with beef and dairy cattle, poultry, sheep, swine, laboratory animals, fish, horses, meat and dairy products.

2. Introductory Animal Science (3) III. Touchberry
Lecture—2 hours; laboratory—3 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.

15. Introductory Horse Husbandry (3) II. Evans
Lecture—3 hours. Prerequisite: course 2 recommended. An introduction to the care and use of light horses emphasizing the basic principles for selection of horses, responsibilities of ownership, recreational use and raising of foals.

21. Livestock and Dairy Cattle Judging (2) II, III. Van Liew
Laboratory—6 hours. Prerequisite: course 1 or 2 recom-

NOTE: For key to footnote symbols, see page 123.

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.

22A-22B. Animal Judging (2-2) II-I. Van Liew
Laboratory—6 hours; weekend field trips. Prerequisite: course 21. The study of individual and group classes of animals with emphasis on visual appraisal of conformation and its accurate description. Course is required for intercollegiate judging competition. (P/NP grading only.)

24. Introductory Aquaculture (3) III. Gall
Lecture—3 hours. Prerequisite: Biological Sciences 1. Aquatic animal production with particular reference to growth, reproduction, inheritance, nutrition and disease.

31A. Perspectives in Animal Science (1) I, Bywater
Lecture—1 hour. Consideration of the broad scope of opportunities in Animal Science and related fields and assessment of information on basic ingredients for a successful career. Of special interest to students new to the campus. (P/NP grading only.)

31B. Current Topics in Animal Science (1) II. Bywater
Lecture—1 hour; occasional discussion. Lectures, assigned reading and discussion of topics of current concern in the broad area of animal science. Topics may include land utilization; livestock, poultry and game production; nutritional, genetic, physiological and health management. (P/NP grading only.)

31C. Prospects in Animal Science (1) III. Heitman
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.)

41. Domestic Animal Production (4) I, II. DePeters.
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 1 and 2. Introduction to the principles of farm-animal husbandry. Animal species to be discussed include dairy and beef cattle, sheep, swine, and horses. Topic areas are industry trends, general husbandry, nutrition, and reproduction. Laboratory exercises will utilize field trips and animal husbandry practices.

43. Elements of Livestock Management (3) III. Bywater
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 41 and Economics 1A recommended. Introduction to the concepts of, factors affecting and interactions between biological and economic efficiency, and implications for the organization and management of livestock businesses.

49A-49B-49C. Animal Management Practices (2-2-2) I-II-III. The Staff (Heitman in charge)
Discussion—1 hour; laboratory—3 hours. The application of the principles of elementary biology; the art and science of management of beef and dairy cattle, horses, sheep, swine, and laboratory animals. (P/NP grading only.)

92. Internship in Animal Science (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-18 hours. Prerequisite: consent of instructor. Work-learn experience off and on campus in dairy, livestock, and aquaculture production, research and management; or in a business, industry, or agency associated with these or other animal enterprises. All requirements of Internship Approval Request form must be met. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Selected topics relating to the animal sciences. 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. Problems in animal biology; nutrition, breeding, and physiology of livestock. (P/NP grading only.)

Upper Division Courses

104. Principles of Domestic Animal Behavior (3) I, Price
Lecture—3 hours. Prerequisite: Biological Sciences 1 or Zoology 2 or the equivalent. To examine the basic principles of animal behavior as applied to domesticated species. Emphasis will be placed on the behavioral development and social behavior. External (exogenous) and physiological mechanisms influencing behavior will be discussed. Students who have received credit for Zoology 155 may receive only 2 units for this course.

105. Behavioral Adaptations of Domestic Animals (2) II. Price
Lecture—2 hours. Prerequisite: course 104 or the equivalent. To provide an in-depth examination of the behavior of domestic animals and the role of behavior in management.

105L. Behavioral Adaptations of Domestic Animals Laboratory (2) II. Price
Laboratory—3 hours, plus 3 hours to be arranged. Prerequisite: to be taken concurrently with or following course 105. To provide a research experience investigating the behavior of selected domestic animal species. Methods of data collection and analysis will be discussed.

113A. Applied Swine Production (2) Extra-session summer. Berger, Calvert
Lecture—1⅔hours and laboratory—3⅓hours (Summer Session I). Prerequisite: students with agricultural or biological science and animal production background. Swine and management including hand breeding, gestation, farrowing, baby pig management and finishing pig management.

113B. Applied Swine Production (2) Extra-session summer. Berger, Calvert
Lecture—1⅔hours and laboratory 3 ⅓hours (Summer Session II). Prerequisite: course 113A. Continuation of 113A. Male reproductive physiology, semen handling, artificial insemination, nutrition, housing, marketing and record keeping systems.

114. Dairy Cattle Production (4) III. Laben
Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107. Recommended: Nutrition 103 or 110 and course 124, or the equivalent. Scientific principles from genetics, nutrition, physiology and related fields applied to conversion of animal feed to human food through dairy animals. Genetic, environmental, and managerial sources of variation in milk composition and yield; economic and energetic efficiency of milk production.

115. Advanced Horse Production (4) I, Evans
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 15, Genetics 120; Nutrition 103 or 110; Physiology 110. Feeding, breeding, and management of horses; application of the principles of basic animal sciences to problems of production of all types of horses. Designed for students who wish to become professionally involved in the horse industry.

116. Meat Animal Production (4) III. Garrett, Bradford
Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107; Nutrition 103 or 110; Physiology 110. Application of the sciences of nutrition, physiology, and genetics to the development of efficient management programs for beef, sheep, and swine production. Similarities and differences among these species affecting management practices. Methods of improving carcass and meat quality.

118B. Intensive Livestock Production (3) II. Heitman, Laben, Zinn
Lecture—3 hours. Prerequisite: Nutrition 103 or 110; courses 1, 2, Genetics 120 or Animal Genetics 107 recommended. Principles and practices involved in feedlot, dairy, and swine operations. Growth and fattening; lactation; feeding practices; methods of evaluating body composition of meat animals; housing and equipment; waste disposal.

119. Experimental Aquaculture (15) I, Chang
Lecture—3 hours; discussion—2 hours; laboratory—30 hours. Prerequisite: upper division standing in biological discipline with background in physiology, genetics, microbiology, or biochemistry and consent of instructor; introductory course 24 and course 131 strongly recommended. In-depth study at the Bodega Marine Laboratory, integrating trends and history of aquaculture with experimental principles from genetics, nutrition, pathology, physiology and related fields as applied to practical aspects involved with culture of aquatic species with food production potential. (Application forms available in Animal Science Advising Center.)

120. Principles of Meat Science (3) III. Bandman (Food Science and Technology), Lee
Lecture—3 hours. Prerequisite: Biochemistry 101B or the equivalent. Anatomical, physiological, development and biochemical aspects of muscle underlying the conversion of muscle to meat. Includes meat processing, preservation, microbiology and public health issues associated with meat products. (Same course as Food Science and Technology 120.)

120L. Meat Science Laboratory (2) III. Lee, Bandman (Food Science and Technology)
Discussion—1 hour; laboratory—3 hours. Prerequisite: Biochemistry 101B; course 120 (may be taken concurrently). Laboratory exercises and student participation in transformation of live animal to carcass and meat, structural and biochemical changes related to meat quality, chemical and sensory evaluation of meat, and field trips to packing plant and processing plant. (Same course as Food Science and Technology 120L.)

123. Animal Growth (4) II. Garrett, Ashmore, Bradford
Lecture—4 hours. Prerequisite: upper division course in genetics, physiology and nutrition or the equivalent. Basic and practical aspects of prenatal, postnatal and adult growth of animals focusing on nutritional, physiological, and genetic effects and interrelationships.

124. Lactation (4) II. Baldwin, Laben
Lecture—3 hours; laboratory—3 hours. Prerequisite: Physiology 110 and Nutrition 110 or the equivalent background knowledge. Consideration of the biochemical, genetic, physiological, nutritional, and structural factors relating to mammary gland development, the initiation of lactation, the composition of milk and lactational performance.

128. Linear Programming in Animal Agriculture (2) III. Bywater
Lecture—1 hour; discussion—1 hour. Prerequisite: intended for seniors with an understanding of animal production and of nutrition at least equivalent to Nutrition 103 or 110. A non-theoretical treatment of the use of linear programming and its applications in animal agriculture emphas izing farm planning and ration formulation. Intended to provide hands-on experience in developing and applying linear programs. (P/NP grading only.)

131. Reproduction and Early Development in Aquatic Animals (4) II. Doroshov
Lecture—3 hours; laboratory—3 hours. Prerequisite: Zoology 100; Wildlife and Fisheries Biology 120, 121; or consent of instructor. Physiological and developmental functions related to reproduction, breeding efficiency and fertility of animals commonly used in aquaculture.

133. Meat and Meat Animal Evaluation (3) I, Lee
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 2 or 21 recommended. Correlation of live animal conformation and degree of finish with carcass traits, transformation of live animal to carcass, criteria for evaluation and grading of carcasses as related to meat palatability, ante- and post-mortem handling as related to meat quality.

135. Experimental Biochemistry Laboratory (4) I, Ashmore
Lecture—2 hours; laboratory—6 hours. Prerequisite: one course each in biochemistry and physiology; consent of instructor. Course designed to introduce student to concepts of research. Experience in research animal care, tissue sampling and handling techniques, a variety of commonly used laboratory analytical methods, cost analysis, literature review and publication writing are provided. Not open to students who have received credit for Biochemistry 101L.

140. Management of Laboratory Animals (4) I, Adams
Lecture—3 hours; laboratory—3 hours. Prerequisite: Animal Genetics 107; Nutrition 103 or 110; Physiology 110. Application of the concepts of nutrition, physiology, and genetics to maintenance of experimental animals. Management procedures will be examined in view of experimental needs, government regulations, and animal health.

160. Range Livestock Production (4) III. Morris, Raguse (Agronomy and Range Science)
Lecture—3 hours; discussion—1 hour. Prerequisite: Nutrition 103 or 110 or 122; Range Science 100 or 133 or 134; upper division standing. Application of principles of animal and range science to the extensive production of livestock and related products from range. Emphasis on beef and sheep production systems from perennial and annual range types. (Same course as Range Science 160.)

190. Proseminar in Animal Science (1) I, Heitman
Seminar—1 hour. Prerequisite: senior standing in Animal Science or consent of instructor. Reports and discussions of recent advances in animal science.

190C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: advanced standing; consent of instructor. Weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (P/NP grading only.)

192. Internship in Animal Science (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in dairy, livestock and aquaculture production, research and management; or in a business, industry, or agency associated with these or other animal enterprises. All requirements of Internship Approval Request Form must be met. (P/NP grading only.)

197T. Tutoring in Animal Science (1-2) I, II, III. The Staff (Chairperson 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 (Chairperson 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 (Chairperson in charge)
Prerequisite: consent of instructor. Problems in animal biology related to nutrition, breeding and physiology of large domestic livestock. (P/NP grading only.)

Graduate Courses

205. Computer Analysis of Biological Data (3) II. Famula
Lecture—3 hours. Prerequisite: Agricultural Science and Management 150. The use of matrix algebra, regression and least squares programs to manipulate and analyze

NOTE: For key to footnote symbols, see page 123.

balanced and unbalanced biological data. Lectures will be concerned with the analytical procedures used in the programs as well as interpretation of computer output.

210. Advanced Meat Science and Technology (3) II. Lee
Lecture—2 hours; discussion—1 hour; laboratory—2 or 3 sessions. Prerequisite: course 120 or the equivalent; courses 133 and 135 recommended. Integration of muscle biochemistry and meat quality; basis of meat tenderness; physiochemical properties of meat emulsion; new concepts in fresh and cured meat processing technology; energy efficiency in processing and marketing of meat products. Offered in even-numbered years.

211. Hereditary Disorders of Muscle, Bone and Connective Tissues in Large Animals: Models for Human Disease (3) II. Ashmore
Lecture—3 hours. Prerequisite: Biochemistry 101A-101B and Physiology 100A-100B or the equivalent (may be taken concurrently). Etiology and pathology of hereditary disorders of muscle, bone, and connective tissues in large animals and their usefulness in research as models for analogous diseases in humans.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Reports and discussions of topics of interest in genetics, nutrition, and physiology as they apply to animal science. (S/U grading only.)

290C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate standing. Weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (S/U grading only.)

297. Supervised Teaching in Animal Science (2) I, II, III. The Staff (Chairperson in charge)
Supervised teaching—6 hours. Prerequisite: consent of instructor. Practical experience in teaching Animal Science at the University level; curriculum design and evaluation; preparation and presentation of material. Assistance in laboratories, discussion sections, and evaluation of student work. An evaluation letter sent to the Graduate Adviser with a copy to the student. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Lectures and discussions of advanced topics in the animal sciences. (Sect. 1, 2, 3—letter grading; from Sect. 4 on—S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Anthropology

(College of Letters and Science)

Henry McHenry, Ph.D., Chairperson of the Department

Department Office, 328 Young Hall (752-0745/0746)

Faculty

Edwin B. Almirol, Ph.D., Assistant Professor *(Applied Behavioral Sciences)*
Robert L. Bettinger, Ph.D., Associate Professor
David J. Boyd, Ph.D., Assistant Professor
Jay B. Crain, Ph.D., Assistant Professor in Residence *(Psychiatry)*
Daniel J. Crowley, Ph.D., Professor *(Anthropology, Art History)*
Richard T. Curley, Ph.D., Associate Professor
[2,3]William G. Davis, Ph.D., Associate Professor
Jack D. Forbes, Ph.D., Professor *(Anthropology, Applied Behavioral Sciences)*
Sarah B. Hrdy, Ph.D., Professor
[1]Suad Joseph, Ph.D., Associate Professor
Henry McHenry, Ph.D., Professor
David L. Olmsted, Ph.D., Professor
Benjamin S. Orlove, Ph.D., Associate Professor *(Environmental Studies)*
Peter S. Rodman, Ph.D., Associate Professor
Janet S. Shibamoto, Ph.D., Assistant Professor
David G. Smith, Ph.D., Associate Professor
Lenora Timm, Ph.D., Associate Professor *(Linguistics)*
[3,4]Delbert L. True, Ph.D., Professor
Carolyn F. Wall, Ph.D., Associate Professor
Miriam J. Wells, Ph.D., Associate Professor *(Applied Behavioral Sciences)*

The Major Program

Anthropology is a broad and diverse field with many subdisciplines, subdivided here at Davis into four categories—physical, social/cultural, linguistics, and archaeology. The goals for the Anthropology major are to train students for graduate study leading toward professional careers in anthropology and to provide background resources for teaching in primary and secondary education.

Students interested in the scientific study of human origins, primate studies and the fundamentals of biology as these relate to *Homo sapiens* should enroll in the Bachelor of Science degree program. Students interested in ethnography and the ethnology of selected culture areas, linguistics (language in culture and society with an emphasis on linguistic field methods), and archaeology (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
Statistics 13	4
Geography 1 or Environmental Studies 10	4
Foreign language (18 units or the equivalent)	0-18
Depth Subject Matter	**44**
Anthropology 102, 103A, 109, 110, 128	20
Anthropology, one course from 111, 112, 120	4
Physical anthropology, one course	4
Ethnography, one course	4
Archaeology, one additional course	4
An additional 8 units selected from the following: any upper division anthropology course, Art 150, 151, Genetics 100A, 100B	8
Total Units for the Major	**64-82**

Anthropology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**46-59**
Anthropology 1, 2, 3, 5	16
Biological Sciences 1	5
Chemistry 1A, 1B	10
Statistics 13, 32, or 102	3-4
Zoology 2, 2L	6
Chemistry 8A-8B or Mathematics 16A-16B	6
Foreign language (12 units or the equivalent)	0-12
Depth Subject Matter	**45**
Six courses in anthropology, including at least 3 in physical anthropology, and the remaining 3 chosen in consultation with major adviser	23-24
Genetics 103 and 100A-100B or 120	7-9
Additional units from the list below to achieve a minimum of 45 upper division units. Include at least one laboratory course in human or vertebrate anatomy.	
Total units for the Major	**91-104**

Recommended
Geology 1, 1L, 3, 3L; Physics 2A, 2B, 2C; Psychology 1, 15.

Bachelor of Science List of Courses
Physical anthropology: 151, 152, 153, 154A, 154B, 155, 156, 157, 157L.

Upper division courses outside the Department: Anatomy 100; Biochemistry 101A, 101B; Botany 140; Environmental Studies 100, 125; Epidemiology and Preventive Medicine 402, 403, 404; Genetics 100A, 100B, 102A, 102B, 103, 104, 105, 120; Geography 117; Geology 106, 107; Human Anatomy 101; Physical Education 103; Physiological Sciences 101A, 101B; Physiology 110, 110L; Psychology 108, 112, 150; Statistics 130A, 130B; Zoology 100, 105, 106, 125, 136, 141, 147, 148, 155.

Major Advisers. A.B. degree: W.G. Davis, S. Joseph, J.S. Shibamoto; B.S. degree: P.S. Rodman, D.G. Smith.

Minor Program Requirements:

	UNITS
Anthropology	**19-24**
General emphasis	**22-24**
Anthropology 120	4
One course from Anthropology 151, 152, 153, 154A, 154B, 156, 157, 157L	2-5
One course from Anthropology 103A, 103C, 103D, 103E, 103F	4
One course from Anthropology 105A, 105B, 106A, 106B, 106C, 108, 135, 136, 139A, 139B, 140, 143, 146, 147, 190, 191	4
One course from Anthropology 102, 114, 116, 119, 121, 122, 123, 124, 126, 127, 128, 130, 141, 162, 163	4
One additional course from remaining upper division Anthropology courses	4
Biological emphasis	**20-21**
Anthropology 152, 153, 154A	13
Two additional upper division Anthropology courses chosen in consultation with B.S. degree undergraduate adviser	7-8
Social-Cultural emphasis	**19-20**
Anthropology 102	4
One course from Anthropology 105A, 105B, 106A, 106B, 106C, 135, 139A, 139B, 140, 143, 147, 190, 191	4
Two courses from Anthropology 101, 119, 120, 121, 122, 123, 124, 126, 127, 128, 130, 141, 163	8
One additional upper division Anthropology course chosen in consultation with A.B. degree undergraduate adviser	3-4

Teaching Credential Subject Representative. ———. See page 98 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 Adviser. R.L. Bettinger.

Related Courses. See Native American Studies 20.

Courses in Anthropology

Lower Division Courses

1. Physical Anthropology (4) I, McHenry; II, Rodman; III, Smith
Lecture—3 hours; discussion—1 hour. Introduction to human evolution. The processes and course of human evolution; man's place in nature and the study of primates; the biological variability of living man and the genetic background.

2. Cultural Anthropology (4) I, Curley; II, The Staff; III, Boyd
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 human biology, culture, and society.

5. Proseminar in Biological Anthropology (4) III. Rodman
Seminar—3 hours; term paper. Prerequisite: course 1 and consent of instructor. Course primarily for majors. Integration of related disciplines in the study of biological anthropology through discussion and research projects. Principal emphasis in human adaptation to the environment. Offered in odd-numbered years.

15. Behavioral and Evolutionary Biology of the Human Life Cycle (5) II. Rodman
Lecture—3 hours; discussion—1 hour; term paper. Introduction to the biology of birth, childhood, marriage, the family, old age, and death. Examines comparative characteristics of nonhuman primates and other animals as well as cross-cultural variation in humans by study of selected cases.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Primarily intended for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

Upper Division Courses

***101. Principles of Human Ecology** (4) II. Davis
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 or 10 and Sociology 1 or Anthropology 2 recommended. An examination of the critical variables in the processes that relate man to his environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Environmental Studies 101.)

102. Theory in Social and Cultural Anthropology (4) I, Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introduction to varieties of explanation in anthropology; discussion of controversy surrounding relations between the designation of problem areas, choice of concepts, and selection of facts in the construction of anthropological theory.

103A. Archaeological Theory and Method (4) II. Bettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1, 3, and Statistics 13. Theory and method of prehistoric archaeology.

103C. New World Prehistory: The First Arrivals (4) I. The Staff
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) II. Bettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The collectors: cultural diversification in post Pleistocene settings.

***103E. New World Prehistory: Formative Lifeways in North and South America** (4) III.
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. The Staff
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. Forbes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introductory survey of the Indians of North America: origins, languages, civilizations, and history.

***105B. Indians of South America** (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. An introductory survey of the Indians and South America: origins, languages, civilizations, and history.

***106A. Prehistory of California and the Great Basin** (4) II. True
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Description and analysis of peoples of California and the Great Basin (and their remains) from earliest times to Euro-American contact.

106B. Ethnography of California and the Great Basin (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Description and analysis of the native peoples of California and the Great Basin and their lifeways at the time of Euro-American contact.

***106C. Ethnohistory of California and the Great Basin** (4) III. Forbes
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Description and analysis of the native peoples and groups of California and the Great Basin since Euro-American contact.

***107A. Old World Prehistory** (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The beginnings and development of cultural phenomena during the Pleistocene epoch. A critical and comprehensive survey of known cultural phenomena beginning some 2 million years ago and extending through the terminal stages of the last glacial period. Will include material from Africa, Asia and Europe.

***107B. Old World Prehistory** (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. The first farmers. Development of a new way of life following the end of the Pleistocene. A critical and comprehensive survey of cultural developments during the period of time from the end of the Pleistocene through Neolithic times in Africa, Asia and Europe.

***107C. Old World Prehistory** (4) II.
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, morpho-phonemics, 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. Wall
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; course 4 or Linguistics 1. The social and linguistic aspects of verbal behavior. Participants, situations, and functions of communication. Speech communities, language and social stratification, bi- and multi-lingualism. (Same course as Linguistics 114.)

***116. Introduction to Ethnographic Research** (4) III.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 102. Guidelines for the proper conduct of ethnographic research; standards for evaluating ethnographic literature.

***119. Culture and Personality** (4) I, Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Comparative exploration of the "individual" in non-human primate, foraging, horticultural, pastoral, agricultural, and industrial societies. Impact of labor and political processes, ruralization, urbanization, class and state formation, change, poverty, warfare and the emergence of world cultural systems.

120. Language and Culture (4) III. Wall
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2; course 4 or Linguistics 1. Language and thought; systems of classification; linguistic aspects of culture and society.

***121. Folklore** (4) III. Crowley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or literary preparation acceptable to instructor. Theory and method in the study of folktales, myths, legends, proverbs, riddles, songs, and other forms of verbal tradition.

***122. Economic Anthropology** (4) II. Davis
Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Economic behavior in nonindustrial societies; its social and cultural setting and its modern changes.

***123. Political Anthropology** (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. A survey of functional, structural, organizational, and decision-making approaches to primitive, tribal, and peasant political organization. Some attention will be given to political modernization within the setting of the colonial situation.

124. Religion in Society and Culture (4) III. Curley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Discussion of anthropological theories of religion with emphasis on non-literate societies. Survey of shamanism, magic and witchcraft, rituals and symbols, and religious movements. Extensive discussion of ethnographic examples and analysis of social functions of religious institutions.

126. Anthropology of Development (4) I, Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of theories of social and economic change. Social and economic consequences of technological innovation. Application of anthropological theory to case studies of rural economy and society.

***127. Urban Anthropology** (4) III. Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of approaches to urban living: political structures, organization of labor, class relations, world views. The evolution of urban life and its contemporary dilemmas. Cross-cultural comparisons discussed through case studies.

***128. Kinship and Social Organization** (4) III. Davis
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Theoretical discussion of social organization with primary emphasis on typology and classification of family and kinship systems.

***130. Sex Roles: An Anthropological Perspective** (4) II. Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Study of sex roles in primitive and complex societies. Impact of different political and economic systems on male and female activities and identities in evolutionary perspective issues from the contemporary women's movement around the world.

132. Festivals and Carnivals (4) III. Crowley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic and folkloric analysis of selected festivals based on ethnic, religious, regional, class, vocational, and other affiliations.

***135. Peoples and Cultures of Southeast Asia** (4) III. Davis
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or the equivalent, or consent of instructor. The development of major cultural traditions, the patterns of ecological relationships, and comparative social organization of ethnic and regional groups in Southeast Asia. Offered in even-numbered years.

***136. Cultures and conflict in the Middle East** (4) I, Joseph
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of the peoples of the Middle East (including North Africa). Topics include class relations, kinship organization, sex roles, religious behavior, ethnic identities, systems of politics. Impact of European colonization, contemporary political movements, and social change.

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) I, Curley
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of Eastern, Central and Southern Africa with analyses of representative societies which illustrate problems of general theoretical concern. Major consideration will be continuities and discontinuities between periods prior to European contact and the present.

140. Peoples of Afroamerica (4) 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.)

143. Contemporary Societies of South America (4) II. Orlove
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. An introductory survey of the history and contemporary structure of South American society. Social, economic and political organization in the countryside and city. Patterns of national integration and conflict.

***147. Peoples of the Pacific** (4) I, Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Ethnographic survey of aboriginal cultures of Oceania. Comparison of origins, prehistory, and traditional social organization of peoples of Polynesia, Micronesia, and Melanesia. Consideration of recent changes associated with colonialism and national independence.

151. Primate Evolution (4) III. McHenry
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; Zoology 2 recommended. The origin and relationships of the prosimians, monkeys, and apes.

152. Human Evolution and Fossil Man (4) II. McHenry
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Nature and results of the evolutionary processes involved in the formation and differentiation of mankind.

153. Human Biological Variation (4) I, Smith
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. The origin, adaptive significance and methods of analysis of genetic differences among human populations. Special attention will be given to racial differences such as those in blood groups, plasma proteins, red cell enzymes, physiology, morphology, pigmentation and dermatoglyphics.

NOTE: For key to footnote symbols, see page 123.

154A. Ecology and Sociobiology of Primates (5) I, Rodman
Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: course 1. Examines ecological diversity and evolution of social systems of prosimians, monkeys, and apes, placing the social behavior of the primates in the context of appropriate ecological and evolutionary theory.

***154B. Ecology and Sociobiology of Primates** (4) III. Rodman
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 154A, Statistics 13 (or the equivalent), and consent of instructor. Continuation of course 154A for students interested in methods of studying, describing and analyzing the ecology and sociobiology of primates. Laboratory consists of direct observation of captive primates and local birds with quantitative analysis of observations. Offered in even-numbered years.

***155. Comparative Primate Anatomy** (4) III. McHenry
Lecture—2 hours; laboratory—4 hours. Prerequisite: Zoology 2-2L. The functional anatomy of monkeys, apes, and man. Emphasis on the anatomical evidence for human evolution. Offered in even-numbered years.

156. Human Osteology (4) III. McHenry
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or the equivalent. Introductory study of the human skeleton, including bone growth, pathology, radiology, evolution, dentition, and variations in race, sex, and age. Offered in odd-numbered years.

157. Anthropological Genetics (3) II. Smith
Lecture—3 hours. Prerequisite: course 1 or Biological Sciences 1, and Genetics 100B or 120. Processes of microevolution responsible for biological differences among human populations. Special attention will be given to the adaptive significance of genetic variation in blood group antigens, serum proteins and red cell enzymes.

157L. Laboratory in Anthropological Genetics (2) II. Smith
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1 or Biological Sciences 1, and either Genetics 100B or 120; enrollment in course 157 (concurrently or following). Methods for identifying genetic variation in human blood group antigens, serum proteins and red cell enzymes (hemaglutination), general electrophoresis on starch, cellulose acetate and polyacrylamide, immunodiffusion and immunoelectrophoresis on agarase. Offered in even-numbered years. (P/NP grading only.)

***162. Peasant Society and Culture** (4) III. 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. Wallacker (Oriental Languages and Civilizations)
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) III. Shibamoto
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Development of Japanese cultural traditions; social structure and social trends.

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (True in charge)
Prerequisite: open only to majors of senior standing who qualify for honors program. Independent study of an anthropological problem involving the writing of an honors thesis. (P/NP grading only.)

***195. Field Course in Archaeological Method** (3) III. True
Laboratory—8 hours. Prerequisite: course 3. Lectures, museum preparation, and weekend excavations. May be repeated for credit with consent of instructor. Limited enrollment.

196. Archaeological Method (3) I, Bettinger
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
Tutorial—1-5 hours. Prerequisite: upper division standing with major in anthropology and consent of Department Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

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

Graduate Courses

201. History of Anthropological Theory (4) I, Curley
Lecture—2 hours; discussion—1 hour. The historical development of the various fields of anthropology with emphasis upon their interrelationships.

***202. History and Theory of Physical Anthropology** (4) II. The Staff
Seminar—3 hours. The history of thought in physical anthropology and an analysis of the major theoretical problems in the field. Suggested for all first-year graduate students lacking intensive preparation in biological anthropology.

203. History and Theory of Archaeology (3) I, ———, Bettinger
Seminar—3 hours. The history of thought in archaeology and analysis of research methods.

204. Contemporary Issues in Anthropological Theory (4) II. Boyd
Seminar—3 hours; one unit for paper required. Prerequisite: course 2, 102 or consent of instructor. Advanced consideration of fundamental issues in anthropological theory. Emphasis on critical examination of major contemporary debates between proponents of competing theories.

206. Research Design and Method in Social Anthropology (5) I, Joseph
Seminar—4 hours; individual student-instructor session (in-depth work on proposal writing). Prerequisite: consent of instructor. Formulation of research problems and preparation of research proposals; relationships between theory and method, funding, prefieldwork preparations, entering the community, field research techniques, and problems of ethics; intensive work on proposal writing. May be repeated once for credit. Limited enrollment.

209. Objectives and Methods for College Teaching of Anthropology (2) I, II, III. The Staff
Discussion—2 hours; assignments and reports. Prerequisite: normally limited to teaching assistants in anthropology. Analysis of the elements of effective teaching, drawing upon the student's experience in the classroom situation.

210. Aspects of Culture Structure (4) I, III.
Seminar—3 hours. Analysis of various phases of culture, such as religion, economics, law, and folklore.

211. Advanced Topics in Cultural Ecology (3) I, Orlove
Lecture—3 hours. Prerequisite: graduate standing; Anthropology/Environmental Studies 141 or the equivalent or consent of instructor. Discussion and evaluation of theories which relate environment, culture and social structure. The works of several major theorists will be examined with regard to analytical models, empirical data, research method ologies, and modes of explanation. Offered in odd-numbered years. (Same course as Ecology 211.)

216. Problems in Archaeological Method (4) II. The Staff
Seminar—3 hours. Techniques for analyzing archaeological data; application to various prehistoric cultures. May be repeated for credit with consent of instructor.

***217. Andean Prehistory: Theory and Method** (4) II. True
Seminar—3 hours. Prerequisite: consent of instructor. Discussion and evaluation of prehistoric occupations in the Andean Region of South America. Emphasis upon Preceramic and early farming peoples.

***218. Topics in North American Prehistory** (4) II. Bettinger
Seminar—3 hours; paper. Advanced study on current problems in North American prehistory and archaeology. May be repeated for credit only if material is unique for that student, and with consent of instructor.

220. Field Course in Linguistics (4) III. 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) III. Orlove
Seminar—3 hours. Prerequisite: courses 223, 265, or consent of instructor. Problems of rural transformation arising out of political and economic interaction between national elites and rural regional and local populations under varying conditions of induced change in postcolonial societies. Attention will be given to the implications of this interaction for rapid economic growth. May be repeated for credit.

***222. Problems in Urban Anthropology** (4) I, Joseph
Seminar—3 hours; one paper. Prerequisite: graduate status or consent of instructor. Study of selected critical problems in urban anthropology. Each quarter focuses on some of the following topics: class, minorities, poverty, migration, religion, politics, kinship, community, sex-roles, communication, ideology, consciousness in urban context. May be repeated for credit.

***223. Economic Anthropology** (4) III. Davis
Seminar—3 hours. Prerequisite: course 122 or consent of instructor. Selected current methodological and theoretical problems in the analysis of nonindustrial economic systems.

***224. Problems in Comparative Religion** (4) II. Curley
Seminar—3 hours. Advanced study of current problems in the anthropological study of religion.

***239. Problems in African Society and Culture** (4) I, Curley
Seminar—3 hours. Diachronic analyses of traditional institutions in sub-Saharan Africa.

***240. Problems in Afro-American Studies** (4) III. Crowley
Seminar—3 hours. Comparative studies of selected Black communities in the New World.

***241. Topics in North American Ethnology** (4) II.
Seminar—3 hours; term paper. Advanced study on current problems in North American ethnography and culture history. May be repeated for credit with consent of instructor.

***245. Ethnology of Northern and Central Asia** (4) II. Olmsted
Seminar—3 hours. Prerequisite: a reading knowledge of German, Russian, Chinese, or Japanese. Lectures on the culture aboriginally found north of the Caucasus-Korea line. Supervised study of the primary and secondary sources. Work with informants when available.

***246. Ethnology of Europe** (4) II. Olmsted
Seminar—3 hours. Prerequisite: reading knowledge of a European language other than English. Supervised study of the primary and secondary sources dealing with the ethnography and ethnology of the peoples of Europe. Emphasis upon folk, peasant, and minority groups.

***252. Human Evolution Seminar** (4) II. McHenry
Seminar—3 hours. Prerequisite: course 152 or the equivalent; consent of instructor. Study of selected topics in human evolutionary studies. Each year course will focus on one or more of the following: molecular evolution, primate evolutionary biology, Tertiary hominoids, *Australopithecus*, *Homo erectus*, archaic *Homo sapiens*, brain evolution. May be repeated for credit.

253. Seminar in Human Biology (4) III. Smith
Seminar—3 hours. Prerequisite: course 153 or consent of instructor. Study of selected topics in human biology.

254. Primate Behavior (4) I, Hrdy
Seminar—3 hours. Prerequisite: course 154B or the equivalent. Analysis of primate behavior, with particular emphasis on preparation for field studies.

***265. Concepts and Problems in Applied Anthropology** (4) II.
Seminar—3 hours. Prerequisite: consent of instructor. Advanced study in culture change; case studies of directed culture change; problems of planning and evaluation; uses of anthropological theory and data in professional fields such as agriculture, public health, administration, and international technical assistance.

280. Ethnohistorical Theory and Method (4) 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. Wall
Seminar—3 hours.

298. Group Study (1-4) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Applied Behavioral Sciences

(College of Agricultural and Environmental Sciences)

Glenn R. Hawkes, Ph.D., Chairperson of the Department
———, Vice Chairperson of Community Studies and Development
Louise M. Bachtold, Ed.D., Vice Chairperson of Human Development

Department Office, 106 Academic Office Building-4 (752-0770)

NOTE: For key to footnote symbols, see page 123.

Faculty

[4]J. Howard Adams, Ph.D., Associate Professor
[4]Edwin B. Almirol, Ph.D., Assistant Professor
Louise M. Bachtold, Ed.D., Professor
Keith Barton, Ph.D., Associate Professor
Edward J. Blakely, Ed.D., Professor
Marc Braverman, Ph.D., Adjunct Lecturer
Stephen B., Brush, Ph.D., Adjunct Lecturer
Brenda K. Bryant, Ph.D., Professor
Glen Burch, Ed.D., Lecturer Emeritus
Susan Crockenberg, Ph.D., Associate Professor
Noreen G. Dowling, Ph.D., Adjunct Lecturer
Jack D. Forbes, Ph.D., Professor *(Applied Behavioral Sciences, Anthropology)*
Isao Fujimoto, M.A., Lecturer
Barbara G. Goldman, Ph.D., Lecturer and Supervisor of Teacher Education
James Grieshop, Ph.D., Adjunct Lecturer
Lawrence V. Harper, Ph.D., Professor
Glenn R. Hawkes, Ph.D., Professor
Sarah V. Hutchison, M.Ed., Lecturer
Elwood M. Juergenson, Ph.D., Professor Emeritus
George Kagiwada, Ph.D., Associate Professor
Rosemarie Kraft, Ph.D., Associate Professor
James G. Leising, Ph.D., Lecturer and Supervisor of Teacher Education
Peter C.Y. Leung, M.S., Lecturer
George C. Longfish, M.F.A., Associate Professor
David B. Lynn, Ph.D., Professor Emeritus
E. Dean MacCannell, Ph.D., Professor
Jacquelyn Mitchell, Ed.D., Assistant Professor *(Applied Behavioral Sciences, Afro-American Studies)*
[3,4]Marc Pilisuk, Ph.D., Professor
Carol Raupp, Ph.D., Adjunct Lecturer
Mary C. Regan, Ph.D., Professor
David Risling, M.A., Senior Lecturer
Orville E. Thompson, Ph.D., Professor
Jane N. Welker, M.A., Senior Lecturer
Miriam J. Wells, Ph.D., Associate Professor
[2]Emmy E. Werner, Ph.D., Professor

The Major Program

The Applied Behavioral Sciences major is an interdisciplinary program that is individually tailored by the student along with faculty advisers. The major emphasizes the integration of theory and practice in the study of social issues. It features a perspective on learning that stresses self-development and critical thinking.

Each student majoring in Applied Behavioral Sciences prepares a major proposal that combines: (1) expertise in a topical area of the student's choosing, with (2) an understanding of the social context within which this expertise will be applied. Major proposals are evaluated to ensure that the proposed coursework prepares the student effectively in each of these two areas of emphasis, and that it assists in the realization of the student's stated educational/vocational goals.

Depth subject matter is intended to build competence in the student's area of specialization, while breadth subject matter is designed to provide foundations of knowledge in the natural sciences, social sciences, and humanities, and to develop skills of inquiry and creative endeavor. Examples of recently approved specializations include: Planning for Small Communities, Community Education, Health Care in the Asian Community, and Community and Organizational Development.

Applied Behavioral Sciences graduates have been employed as community developers, planners, social researchers, program evaluators, and organizational and educational consultants. The curriculum also prepares students for pursuit of further study in the social and behavioral sciences.

Applied Behavioral Sciences

B.S. Major Requirements:

	UNITS
Depth Subject Matter	**60**
Individualized program, including senior project, to be determined by student and advisory committee.	
Applied behavioral sciences, upper division courses	20
Additional upper division courses	40
Breadth Subject Matter	**80**
A minimum of 12 units in each of the following areas of study:	
(a) Inquiry: intellectual skills of inquiry and critical analysis.	
(b) Environmental studies: understanding the dynamics of interaction of people and their environment.	
(c) Personal and social behavior: understanding the dynamics of human relationships extending from the individual to the international level.	
(d) Creative expressions: exploration and development of the student's own creative powers,intellectual and aesthetic.	
(e) Basic communication: skill in oral and written communication.	
Unrestricted Electives	**40**
Total Units for the Major	**180**

Breadth Subject Matter
A list of suggested courses in each of the study areas, (a) through (e), may be obtained from the Advising Center.

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 senior project.

Major Adviser. B.G. Goldman.

Advising Center for the major is located in Academic Office Building-4 (752-2244).

Minor Program Requirements:

The Department of Applied Behavioral Sciences offers the following minor programs:

	UNITS
Aging and Adult Development	**24-30**
Applied Behavioral Sciences 177, 191	6
Human Development 100C	4
Psychology 115	4
Human Development 110, Applied Behavioral Sciences 173	8
Practicum, 2 units minimum	2-8

Minor Adviser. G.R. Hawkes.

	UNITS
Asian American Studies	**20**
Asian American Studies 1, 100 or 110, and 101 or 155	12
Two courses selected from the following in consultation with faculty adviser	8
Asian American Studies 111, 112, 150, Anthropology 135.	

Minor Adviser. E.B. Almirol.

	UNITS
Community Development	**23**
Applied Behavioral Sciences 19, 151, 152, 164	15
Two courses selected from the 160 and/or 170 series	8
(a) Applied Behavioral Sciences 162, 163	
(b) Applied Behavioral Sciences 171, 172, 173, 174, 175, 176, 177.	

Minor Adviser. B.G. Goldman.

Graduate Study. See page 94 or the *Graduate Announcement*

Related Courses. See Environmental Studies 10, 101, 141.

Courses in Applied Behavioral Sciences

Lower Division Courses

17. Population Problems: Issues in Human Ecology (2) I, II. Fujimoto
Lecture—2 hours. An interdisciplinary orientation to the critical issues of human ecology and the numerous crises that bear upon the world community. Special emphasis is placed on the interrelationships of the natural ecosystem, population growth, and control, availability of resources, social development, and economic stablity. (P/NP grading only.)

18. Science and Society (3) III. Dowling
Lecture—2 hours; discussion—1 hour. Assumptions and biases in different fields of knowledge, taboo topics, and the nature of evidence in the public and academic communities; fit between University education and issues of society.

19. The Community (3) I, MacCannell
Lecture—2 hours; discussion—1 hour. Exploration of ways in which people come together, and how this is reflected in the expression of community; examination of the dynamics of community change.

47. Orientation to Community Resources (2) II, Thompson; III, Fujimoto
Field trip—3 days; seminar—three 2-hour sessions. (Course given between quarters). Prerequisite: consent of instructor. Field trip to educational, social, and welfare agencies in California. Observation and discussion with staff members of different agencies which serve the needs of families and children. Advance reservations required. (P/NP grading only.)

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Field placement—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only).

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

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) III. The Staff
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. Adams
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) II. Pilisuk
Lecture—4 hours. Prerequisite: course 151 or 152. Communication skills and techniques in community development programs, to include group process and human relations methods useful in community development.

***159A. Field Experience in Community Development** (12) III. Fujimoto
Prerequisite: courses 151 and 152, or consent of instructor. Field assignment-internship with community and grassroots groups, analysis of resources and alternatives for resolution of community development needs.

NOTE: For key to footnote symbols, see page 123.

159B. Field Problems (3) III. Fujimoto
Seminar—3 hours. Prerequisite: course 159A and consent of instructor. Developing, implementing and evaluating field research and problems.

160A. Institutional Research Methods in Applied Behavioral Sciences (4) II. MacCannell
Lecture—4 hours. Prerequisite: upper division status; courses 162 and 163 highly recommended. Application of behavioral science research methodology to multidisciplinary problems confronting organizations. Students electing this course may not receive credit for Native American Studies 140.

***160B. Research Design and Analysis of Institutions** (4) II. Regan
Lecture—3 hours; discussion—1 hour. Prerequisite: course 160A and either Education 114, Statistics 13, or consent of instructor. Applied behavioral science research design and analysis for organization. Methods of data analysis, tests of significance, and use of computer in data processing.

162. People, Work and Technology (4) I, Wells
Lecture—4 hours. Prerequisite: coursework in the social sciences (e.g., Sociology 1, 3, Anthropology 102, Economics 1A, 1B) or labor history. Relationship between work, technology, and people's lives. Such topics as industralization, bureaucratization, automation, the structure of work-linked communities, education and the labor market, work and the economic system and the future of work.

163. Behavior of Community Organizations (4) II. Regan
Lecture—4 hours. Prerequisite: course 162 or consent of instructor. How community organizations function and how members of organizations interact to each other, the organization, and those people who are clients of the organization. Effects of leadership, motivation, group dynamics, communications, and power are considered.

164. Theories in Organizational Change (4) III. Regan
Lecture—2 hours; discussion—2 hours. Prerequisite: course 162. The organization as an open system which changes in response to the internal and external environment. Emphasis on structural, technological and humanistic approaches to change.

165. Family Management in Contemporary Society (4) II. The Staff
Lecture—4 hours. Prerequisite: Human Development 110 and Economics 1A; senior or graduate status recommended or consent of Instructor. Influence of social, economic, political and technological environments on contemporary family roles and goals. Examination of management strategies used by families and types of social support systems needed.

***166. Concepts and Problems in Family Management** (3) III. The Staff
Lecture—3 hours. Prerequisite: course 165 or consent of instructor. Management problems encountered by families, emphasis on home, community, societal issues. Application of theory to problem definition and solution.

171. Housing (4) III. Wells
Lecture—4 hours. Exploration of the shelter aspects of family environment. Study of technological, social, economic, and aesthetic factors affecting the nature and organization of family and community housing.

172. Social Inequality: Issues and Innovations (4) III. Wells
Lecture—4 hours. Prerequisite: upper division standing; 8 units of sociology or anthropology or combination. Study of the phenomenon of inequality in the U.S. Various approaches to inequality will be examined, including structural and historical explanations, prejudice and discrimination, the "culture of poverty," and arguments concerning race, sex, and genetic potential.

173. The Continuing Learner (4) II. Dowling
Lecture—4 hours. Prerequisite: upper division standing. Theories of adult learning and teaching emphasizing the role of adult education in the community. Designing of adult education programs.

***174. Current Issues in Post-Secondary Education** (4) I, Dowling
Lecture—4 hours. Prerequisite: course 151 or 152 recommended; consent of instructor. Historical background, curriculum, governance and finance for the segments of post-secondary education in California. Role of post-secondary education in the community.

175. Education in the Community (4) I, Grieshop
Lecture—4 hours. Prerequisite: upper division standing. Philosophical consideration of the function of education in the community. Relationships of community and non-formal education to formal education, and schooling to individual, community and national development. Study of planning process and role of education in institutional and social settings.

176. Comparative Ethnicity (4) III. Mitchell
Lecture—4 hours. Prerequisite: upper division standing, 8 units of sociology or anthropology or combination. Exploration of the role of ethnicity in shaping social systems and interaction. Examination of analytical approaches to and issues arising from the study of ethnicity, through utilization of data from a range of different societies.

177. Social Aspects of Aging (4) II. Hawkes
Lecture-discussion—4 hours. Prerequisite: Human Development 100C or Psychology 115 recommended. Major characteristics, needs and interests of older people in contemporary America. Emphasis on social problems and community approaches to their solution.

190. Proseminar in Applied Behavioral Sciences (1) I, II, III. Regan
Seminar—1 hour. Prerequisite: consent of instructor. Discussion of selected critical issues in the applied behavioral sciences. Required of seniors in the Applied Behavioral Sciences major. May be repeated for credit. (P/NP grading only.)

191. Proseminar: Issues in Aging (2) III. Hawkes
Seminar—2 hours. Prerequisite: consent of instructor. Discussion of selected critical issues in aging.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Field placement—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Supervising internship, off and on campus, in community and institutional settings. (P/NP grading only.)

196. Senior Project in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: major in Applied Behavioral Sciences and consent of instructor. Guided research leading to completion of senior thesis. May be repeated for credit. (P/NP grading only.)

197T. Tutoring in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Leading of small voluntary discussion groups. (P/NP grading only.)

197TC Community Tutoring in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Supervised tutoring in the community. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Planning Processes in Applied Behavioral Sciences (4) I, Thompson
Lecture—3 hours; supervised practice in planning—3 hours. Prerequisite: consent of instructor. Systematic approach to planning, including new concepts, theories, and methods for planning with application to educational institutions, agencies and the community at large.

202. Systems Approach for Organizational Change (4) II. Regan
Lecture—3 hours; supervised practice in an institution studying the process of change—3 hours. Prerequisite: course 201. Study of institutional processes, resource allocations, communication networks, program priorities and destruct mechanisms needed for change.

203. Evaluation and Decison Making (4) III. Goldman
Lecture—3 hours; supervised practice in evaluation and decision making—3 hours. Prerequisite: course 202. The study of decision-making behavior, theoretical formulations of evaluation and decision making, value conflicts, multiple information requirements at different organizational levels, research techniques and the role of evaluation in programs.

240. Community Development: Research and Analysis (4) I, MacCannell
Seminar—4 hours. Prerequisite: course 160A or Sociology 46A or the equivalent and a course in statistics. Methods of analyzing institutional, community, and regional social structure, as preparation for planned change. Research design and the management of large-scale data files.

241. The Economics of Community Development and Planning Strategies (4) II. Rochin (Agricultural Economics)
Seminar—4 hours. Prerequisite: course 240 and a principle course in economics. Economic theory and planning strategies affecting nonmetropolitan communities. Human resources, community services and infrastructure, industrialization and technological change, policies and plans for mobilizing resources for community development.

242. Community Development: Program Management (4) III. Blakely
Seminar—4 hours. Prerequisite: course 241. Planning, organization, financing and administration of social change projects or programs at the community or city level.

243. Professional Skills for Human Service and Community Development (4) I, Pilisuk
Lecture—2 hours; seminar—2 hours. Prerequisite: graduate student standing in a social science discipline. Theory of interpersonal communication and small group process as applied to development of professional skills as community developer, progam administrator and/or consultant.

290. Seminar (1) II. Pilisuk
Seminar—1 hour. Analysis of research in applied behavioral sciences. (S/U grading only.)

297. Practicum in Community Development (2) III. Pilisuk
Seminar—2 hours. Prerequisite: course 243 and field placement in community human service agency. Application of theories and approaches of community development through field placement in a community or human service agency. Further development of skills as change agents in community settings. Consideration of the field placement as it relates to relevant research. May be repeated for a maximum of 4 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-6) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Applied Physics

See Physics

Aquaculture

See Animal Science

Art

(College of Letters and Science)

Harvey Himelfarb, M.A., Chairperson of the Department

Department Office, 101 Art Building (752-0105)

Art History

(See page 144.)

Art Studio

Faculty

L. Price Amerson, Jr., Ph.D., Adjunct Lecturer
(Director, Nelson Gallery)
[4]Robert C. Arneson, M.F.A., Professor
Richard D. Cramer, M.F.A., Professor Emeritus
[1]William Henderson, M.F.A., Professor
Harvey Himelfarb, M.A., Professor
Ralph M. Johnson, M.A., Professor
Manuel J. Neri, Professor
Roland C. Petersen, M.A., Professor
[4]Cornelia Schulz, M.F.A., Associate Professor
Wayne Thiebaud, M.A., Professor

The Major Program

Studio Art offers courses leading to the Bachelor of Arts degree. The program is composed of courses which provide knowledge and experience which are necessary to a broad understanding of the visual aspects of the humanities and provides a basis for further study and practice, leading to careers in the professions of artist, teacher and other aspects of the field of art.

Portfolios. Entering freshmen who have studied art in high school should apply for advanced

NOTE: For key to footnote symbols, see page 123.

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. Prior to enrolling in Art courses at Davis, ask your faculty adviser to evaluate transfer courses in art.

Art Studio

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**20**
Three courses from Art 2, 3, 4, 5, 16; see prerequisites required for upper division courses	12
Two courses from Art 1A, 1B, 1C, 1D	8
Depth Subject Matter	**36**
Six courses, under three different artists, from Group A, Practice of Art, or Group C, Special Study Courses	24
One course from Group B, Theory and Criticism	4
Two upper division courses in art history	8
Total Units for the Major	**56**

Recommended

(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, 168.

Major Advisers. See the *Class Schedule and Room Directory.*

Minor Program Requirements:

	UNITS
Art Studio	**20**
Upper division art studio courses chosen in consultation with a faculty adviser (one lower division substitute course permissible)	20

Prerequisite courses must be taken prior to enrollment in upper division courses. Independent study courses are not applicable.

Teaching Credential Subject Representative. Department Chairperson. See page 98 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. Detailed information regarding graduate study may be obtained from the *Graduate Announcement.*

Courses in Art (Studio)

Lower Division Courses

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.

10SA. Introduction to Art Appreciation: (4) I, II, III. Thiebaud and staff
Lecture—3 hours; term paper or gallery studies and review. Understanding and appreciation of painting, sculpture, architecture, and industrial art. Illustrated lectures. Intended for students not specializing in art. (P/NP grading only.)

16. Descriptive Drawing (4) I, 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 (Chairperson in charge)
Prerequisite: consent of instructor. Restricted to lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

Note : Upper division courses are listed under three groups: **(A)** Practice of Art; **(B)** Theory and Criticism; **(C)** Special Study Courses.

Group A: Practice of Art

101. Painting: Materials and Carriers (4) I, III. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Experimentation in media and their supports.

102. Painting (4) I, II, III. The Staff
Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 101 or consent of instructor. Advanced painting in various media including oil and polymers. May be repeated twice for credit.

103. Advanced Drawing (4) II. Schulz
Laboratory—8 hours; 4 hours to be arranged. Prerequisite: course 2, 3, 4, 16, or consent of instructor. Advanced drawing, composition and form in black and white and color.

104. Figure Drawing and Painting (4) I, II, III. The Staff
Laboratory—12 hours. Prerequisite: courses 4 and 101, or consent of instructor. Advanced figure drawing and painting using the human figure as subject. May be repeated once for credit.

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 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 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) I, 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. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Film-making as an art form; 8 and 16 mm. cameras and sound track.

***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) II. Cramer
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 5, 16, or compensating backgrounds in design or engineering. Small buildings as art forms, 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) I, III. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Woodcut, linocut, metal-plate relief and experimental uses of other materials. May be repeated twice for credit.

126. Printmaking: Intaglio (4) I, III. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Metal plate etching, aquatint, hard- and soft-ground, burin engraving and related methods. May be repeated twice for credit.

127. Printmaking: Lithography (4) II. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Stone and metal-plate lithography and other planographic methods. May be repeated twice for credit.

***128. Printmaking: Serigraphy** (4) III.
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Silkscreen and related stencil methods. May be repeated once for credit.

***129. Printmaking: Photo-Graphics** (4) I.
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Traditional printmaking methods using photographically derived images: photo-lithography, photo-silkscreen, photo-etching, etc. May be repeated once for credit.

141. Sculpture: Non-Metal Materials (4) I, Johnson
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) III. 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) I, Arneson
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 113 or one from courses 141, 142, 143, or 144. Clay sculpture in relief and round. May be repeated twice for credit.

Group B: Theory and Criticism

147. Theory and Criticism of Photography (4) III. 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) II. Thiebaud
Lecture—3 hours; term paper required. Prerequisite: course 2 or 5, and one art lecture course. Study of forms and symbols in historic and contemporary masterpieces.

***149. Theory and Criticism: Architecture** (4) II. Cramer
Lecture—3 hours; seminar paper. Prerequisite: course 2 or 5, and one art lecture course. Aesthetic theories of design styles, historic and contemporary.

Group C: Special Study Courses

192. Internship (2-12) I, II, III. The Staff (Chairperson in charge)
Internship—term paper or catalog. Supervised program of internships at professional art institutions such as museums, galleries, and art archives including collections of slides and photographs. May be repeated once for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

***201. Experiments in Art and Visual Communication** (4) I. The Staff
Lecture—3 hours. Original work produced for class discussion and criticism. May be repeated for credit.

290. Seminar (4) I, II, III. The Staff
Seminar—3 hours. Original works produced for group discussion and criticism; associated topics of a contemporary and historical nature. May be repeated for credit.

291. Seminar: Critical Evaluation (1) 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)

NOTE: For key to footnote symbols, see page 123.

299D. Comprehensive Project (9) I, II, III. The Staff (Graduate Adviser in charge)
An original body of work accompanied by a catalog summarizing the student's aesthetic position. May be repeated for credit. (S/U grading only.)

Professional Courses

401. Museum Training: Curatorial Principles (4) II. Amerson
Seminar—3 hours. Study of private and public collections. Museum personalities. Appraisal of works of art; ethics of appraisal. Auction and sales: methods and catalogues. Registration. Technical problems of the museum. Connoisseurship. Collateral reading. Visits to museums. Seminar with assigned papers.

402. Museum Training: Exhibition Methods (4) III. Amerson
Seminar—3 hours, exhibition. History of exhibition methods in private and public collections. Comparisons of different types of museums and their exhibition problems. Lighting and techniques of display with emphasis on actual design. Experimentation with unusual presentation forms.

Note: *Various of the above courses are not offered each year; please check quarterly schedules.*

Art History

Faculty

[2]Joseph A. Baird, Ph.D., Professor
Daniel J. Crowley, Ph.D., Professor *(Art, Anthropology)*
Mary H. Fong, Ph.D., Associate Professor
Robert J. Grigg, Ph.D., Associate Professor
Seymour Howard, Ph.D., Professor
[1]Dianne Sachko Macleod, Ph.D., Assistant Professor
Jeffrey Ruda, Ph.D., Assistant Professor

The Major Program

The History of Art program focuses upon the influential role of the visual arts in civilization. It examines works of art as illustrations of changing aesthetic and cultural viewpoints and as reflections of significant material and ideological developments in society. Art history is unusual among the humane disciplines in that it emphasizes visual as well as verbal intelligence, providing more than the standard advantages of a liberal arts training. This program offers a wide and representative introduction to the major fields and issues in art historical studies.

The major prepares students for advanced study either in graduate school, or in professional programs. It can also serve as the foundation for careers in teaching, research, museums, galleries, arts administration, art criticism, publishing, and art investment. Since the study of art history deals with the history of ideas and with different cultures, societies, and events as well as objects and images, we urge majors to strengthen their training with courses in history, literature, philosophy, foreign languages, and political science.

Art History

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**24**
Art 1A, 1B, 1C, 1D	16
One art studio course in drawing, graphics or painting	4
One art studio course in sculpture or ceramics	4
Depth Subject Matter	**36**
Nine upper division art history courses, which must be taken in at least four of the following six areas	36
(a) Ancient	
(b) Medieval/Northern Renaissance	
(c) Southern Renaissance/Baroque	
(d) Modern/American	
(e) China/Japan	
(f) Non-Literate	

Minor Program Requirements:

	UNITS
Art History	**20**
Five upper division art history courses (one lower division substitute course permissible)	20
Courses must be chosen from at least three of the following subject areas with no more than two courses in any single area: (a) Ancient; (b) Medieval/Northern Renaissance; (c) Southern Renaissance/Baroque, (d) Modern/American; (e) China/Japan; and (f) Non-Literate.	

Honors Program. An Honors Program is available to Art History majors who are seriously considering attending graduate school. To be eligible for the program, a student must have a grade-point average of 3.3 in the major. In addition to meeting the standard major requirements, the honors student completes one quarter of language in German or Chinese, one seminar (courses 190 or 198), and writes an honors thesis (course 199). The Honors Program is distinct from the graduation honors awarded by the College of Letters and Science for which students may become eligible by meeting the grade-point requirements of the College; however, students participating in this Program are candidates for Departmental recommendation for graduation with Highest Honors.

Teaching Credential Subject Representative. Department Chairperson. See page 98 for the Teacher Education Program.

Graduate Study. The Department of Art offers programs of study and research leading to the Master of Arts degree in History of Art as preparation for further graduate study or professional work. Further information may be obtained by writing to the Graduate Adviser or consulting the *Graduate Announcement.*

Courses in Art (History)

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. The Staff
Lecture—3 hours; discussion—1 hour. Major styles and masters of the Western world after the Counter Reformation.

1D. Asian Art (4) I, Fong
Lecture—3 hours; discussion—1 hour. An introduction to the arts of Asia through a study of Oriental ink painting and architecture, Buddhist sculpture, Indian temples, Chinese ceramics, Japanese prints, and art in Mao's China.

10HA. Introduction to Art: Art and Civilization (4) I, II, III. The Staff (Ruda in charge)
Lecture—3 hours; term paper or gallery studies and review. Looking at art to understand how aesthetic experience relates to its cultural context, in a variety of historical situations from ancient to modern times. Intended for students not specializing in art. (P/NP grading only.)

***15. Woman as Artist and Subject** (4) III. Macleod
Lecture—3 hours; discussion—1 hour. Assessment of women's contribution to the visual arts. Examines the role of women in context of major artistic and social movements from Renaissance to present. Two midterms; final examination. Offered in even-numbered years.

20. Myths and Symbols in Chinese Art (4) III. Fong
Lecture—3 hours; discussion—1 hour. Heritage of China as seen in the artistic expressions of its mythologies and symbols perpetuated in folk cults, ancestral worship, Confucian lores, Taoist legends, and Buddhist beliefs. Intended for non-majors.

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

150. Arts of Subsaharan Africa (4) I, Crowley
Lecture—3 hours; term paper or gallery studies and review. Traditional arts and crafts of subsaharan Africa; particular attention to the relationships between sculpture and culture in West and Central Africa.

151. Arts of the Indians of the Americas (4) III, 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) II. Crowley
Lecture—3 hours; term paper. Traditional arts of aboriginal Australia, Melanesia, Polynesia, and Micronesia, as seen in their cultural contexts. Prehistoric art of Europe and the Near East.

154A. Early Greek Art and Architecture (4) I, Howard
Lecture—3 hours; gallery study and term paper. Prerequisite: upper division standing. Examination of history and significance of major monuments in Greek art and architecture from the Homeric, Geometric Age to the Golden Age and the death of Socrates.

154B. Later Greek Art and Architecture (4) II. Howard
Lecture—3 hours; gallery studies and term paper. Prerequisite: upper division standing. Examination of the history and significance of monuments in Greek art and architecture from the Silver Age of Aristotle to Alexander to the end of the Hellenistic Age and the death of Cleopatra.

***155. Roman Art** (4) II. Howard
Lecture—3 hours; term paper or gallery studies and review. The art of Republican and Imperial Rome.

***162. History of Printmaking** (4) II. Ruda
Lecture—3 hours; term paper or gallery studies and review. The development of graphic media in the Western World from the fifteenth century to the present.

163A. Chinese Art (4) II. Fong
Lecture—3 hours; term paper or gallery studies and review. A survey from the beginning to the twelfth century focusing on the major art forms that are traditionally known as well as newly discovered through archaeology in China.

163B. Chinese Painting (4) III. Fong
Lecture—3 hours; term paper or gallery studies and review. The unique form of ink painting, with or without colors, depicting human and animal figures, flowers-and-birds, and landscape—the favorite and enduring theme of the Chinese scholar-painter.

164. The Arts of Japan (4) II. Fong
Lecture—3 hours; term paper and/or gallery studies and review (determined by instructor each quarter course offered). Study of the significant achievements in architecture, painting, sculpture, and decorative arts from prehistoric age to nineteenth century.

168. The Design and Development of Great Cities (4) 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) I, Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of the early Christian era and Byzantine Empire: through the later Roman Empire in the West and to the final capture of Constantinople in the East.

176B. Art of the Middle Ages: Early Medieval and Romanesque Art (4) III. Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of western Europe in the early medieval era: from the rise of the barbarian kingdoms through the twelfth century.

***176C. Art of the Middle Ages: Gothic** (4) I, 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) I, Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the sixteenth century in Germany, France and the Lowlands, including such artists as Albrecht Dürer and Pieter Bruegel.

178A. Italian Renaissance Art (4) I, Ruda
Lecture—3 hours; term paper or gallery studies and review.

NOTE: For key to footnote symbols, see page 123.

Giotto and the origins of the Renaissance; painting and sculpture in Italy from Nicola Pisano through Lorenzo Monaco, with emphasis on Duccio, Giotto, and other leading artists of the early fourteenth century. Offered in even-numbered years.

178B. Italian Renaissance Art (4) II. Ruda
Lecture—3 hours; term paper or gallery studies and review. Early Renaissance in Florence; fifteenth-century artists from Donatello and Masaccio through Botticelli, in their artistic and cultural setting.

***178C. Italian Renaissance Art** (4) III. The Staff
Lecture—3 hours; term paper or gallery studies and review. The High Renaissance: Leonardo, Michelangelo, Raphael, and Titian in their artistic and cultural settings—Florence, Rome, and Venice in the early sixteenth century.

***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) III. Ruda
Lecture—3 hours; term paper or gallery studies and review. Seventeenth-century painting, including such artists as Caravaggio, Rubens, Rembrandt, and Velázquez. Offered in odd-numbered years.

183A. Art in the Age of Revolution (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Analysis of political and stylistic implications of European painting from 1750 to 1860. Artists studied include Goya, David, Delacroix, Constable, Turner, the Pre-Raphaelites, and Courbet.

***183B. Impressionism and Post-Impressionism** (4) I, Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Social and cultural study of major European art movements between 1860 and 1900, including an examination of the paintings of Manet, Monet, Renoir, Whistler, Gauguin, van Gogh, Cezanne, and Redon.

***183C. Modern Art: 1900-1945** (4) II. Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Examination of modern movement in European art from Fauvism and Cubism to Surrealism and Abstract Expressionism (1900-1945). Artists studied include Picasso, Matisse, Kandinsky, Malevich, and Pollock.

183D. Modern Sculpture (4) II. Howard
Lecture—3 hours; term paper or gallery studies and review. Sculpture Neo-Classicism to the present.

183E. Contemporary Art: 1945 to the Present (4) II. Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Painting and sculpture in Europe and America from 1945 to the present, with emphasis on the New York school, Pop art, Op art, Earthworks, and Feminist art.

***184. Architecture in the Twentieth Century** (4) III. 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.

***185. History of Art Collecting** (4) III. Baird, Howard
Lecture—3 hours; gallery study and paper. Study of the major eras, personalities, objects, theories and practices in western art collecting. Care and presentation of works of art from antiquity to the present.

***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) III. Macleod
Lecture—3 hours; discussion—1 hour; term paper or gallery studies and review. American pictorial development from 1650 to the present, with emphasis on twentieth-century developments.

***190. Proseminar in the History of Art** (4) I, III. The Staff (Chairperson in charge)
Lecture—3 hours; term paper. Prerequisite: consent of instructor. Intended primarily for senior and junior students in the history of art. Assigned readings, discussions, and a substantial paper in a particular area of art history will introduce the student to methodology and techniques of art historical research. May be repeated once for credit. Limited enrollment.

192. Internship (2–12) I, II, III. The Staff (Chairperson in charge)
Internship—term paper or catalogue. Supervised program of internships at professional art institutions such as museums, galleries, and art archives including collections of slides and photographs. May be repeated once for credit. (P/NP grading only.)

194H. Special Study for Honor Students (4) I, II, III. The Staff
Independent study—12 hours. Prerequisite: Open only to students in the Art History Honors Program. Independent study of an art historical problem culminating in the writing of an honors thesis under the supervision of a faculty guidance committee.

198. Directed Group Study (1-5) I, II, III. The Staff (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

250. Problems in Art Historical Research (4) I, II, III. The Staff
Seminar—3 hours; term paper. Major topics in art historical research, emphasizing special methods of investigation, and of historical and critical analysis. May be repeated for credit.

***251. Seminar in Primitive Art** (4) III. 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 Classical Art (4) III. Howard
Seminar—3 hours; term paper. Selected areas of special study concerning the monuments and legacy of Greek and Roman art and architecture.

***263. Seminar in Chinese Art** (4) I, Fong
Seminar—3 hours; paper. Selected areas of special study in Chinese Art.

***276. Seminar in Medieval Art** (4) II. Grigg
Seminar—3 hours. Selected areas of special study in medieval art from Early Christain to late Gothic.

***277. Seminar in Northern Renaissance Art** (4) II. 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) I, Ruda
Seminar—3 hours. Selected areas of special study in Italian art from trecento to cinquecento.

***283. Seminar in Modern European Art** (4) II. Macleod
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.

299. Individual Study (1-6) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

401. Museum Training: Curatorial Principles (4) II. Amerson
Seminar—3 hours. Study of private and public collections. Museum personalities. Appraisal of works of art; ethics of appraisal. Auction and sales: methods and catalogues. Registration. Technical problems of the museum. Connoisseurship. Collateral reading. Visits to museums. Seminar with assigned papers.

402. Museum Training: Exhibition Methods (4) III. Amerson
Seminar—3 hours. History of exhibition methods in private and public collections. Comparisons of different types of museums and their exhibition problems. Lighting and techniques of display with emphasis on actual design. Experimentation with unusual presentation forms. Seminar and exhibition.

Note: *Various of the above courses are not offered each year; please check quarterly schedules.*

Art History and Art Studio

See Art (above)

Asian American Studies

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Applied Behavioral Sciences.

The Program of Study

Concentration in Asian American Studies is available through the Applied Behavioral Sciences major (see page 141). A minor program, Asian American Studies (see page 141), is also available to students interested in this field of study.

American History and Institutions. This University requirement can be satisfied by one of the following courses in Asian American Studies: 1, 2.

Related Courses

For other Asian languages, see courses in Cantonese (below), and Chinese and Japanese (page 276–77). For other courses see Oriental Languages and Civilizations (page 277), and East Asian Studies (page 171).

Courses in Asian American Studies

Direct questions pertaining to the following courses to the instructor or to the Applied Behavioral Sciences Departmental Office, 106 Academic Office Building-4 (752-0770).

Lower Division Courses

1. Introduction to Asian American Studies (4) I, Almirol; III, Kagiwada
Lecture—3 hours; discussion—1 hour. Asian American experience, 1850 to present with focus on development of a sense of history and identity in context of the larger American society.

2. Contemporary Asian Experience in America (4) II. Kagiwada
Lecture-discussion—4 hours. Analysis of ethnicity, race, and culture as it relates to the identity and growth of the Asian American.

20. Asian Calligraphy (3) I. Leung
Lecture—2 hours; laboratory—3 hours. Prerequisite: knowledge of Cantonese, Mandarin or Japanese helpful. Introduction to Asian calligraphy stressing the technique of writing.

92. Internship (1-12) I, II, III. The Staff (Master Adviser in charge)
Field placement—3-36 hours. Prerequisite: consent of instructor. Supervised internship off and on campus in Asian community and institutional settings related to Asian American concerns. (P/NP grading only.)

Upper Division Courses

100. Asian American Communities (4) II. Kagiwada
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2 or consent of instructor. Political and social status, occupation, income, education, health, housing, and civic culture of various Asian American communities in the United States; segregation in interrelations between geographical groups, relations between rich and poor, patronism, exploitation; mobility within each ethnic group.

101. Language Problems of Asian Immigrants (4) II. Leung
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2. Overview of bilingualism and survey language diversity in Asian American communities. Critical examination of English as a second language (ESL). Asian bilingual pro-

NOTE: For key to footnote symbols, see page 123.

grams and adult English classes for Asian immigrants. Exploration of social, economic and educational impacts on bilingual Asian Americans.

110. Institutional Racism and the Asian American (4) I, Kagiwada
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2 or consent of instructor. Historical and contemporary effects of institutional patterns on Asian Americans.

111. Alienation and the Asian American (4) III. Kagiwada
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2 or consent of instructor. An examination of self-awareness, alienation, and life perspective of Asians in America. Emphasis will be placed on the problems of identity formation of Asian Americans.

112. Asian American Women (4) III. The Staff
Lecture—4 hours. Prerequisite: course 1 or 2. History and struggle of Asian women in America; critically analyze their media images and stereotypes; and discuss in-depth the role of Asian Women in the community movement for social change.

150. Filipino American Experience (4) II. Almirol
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2. Examination of the relationship between the Filipino American community, the Philippine home community and the larger American society through a critical evaluation of the historical and contemporary conditions, problems and prospects of Filipinos in the U.S.

155. Legal History and the Asian American (4) I, Almirol
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2; consent of instructor. Role of law in American society as it affects Asian Americans. Students will study how law has been a tool of social change in Asian American communities.

192. Internship (1-12) I, II, III. The Staff (Master Adviser in charge)
Field placement—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Supervised internship off and on campus in Asian community and institutional settings related to Asian American concerns. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (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.)

Courses in Cantonese

Lower Division Courses

1-2-3. Elementary Cantonese (5-5-5) I-II-III. Leung
Lecture—3 hours; recitation—2 hours. Study of Cantonese, stressing accurate pronunciation, verbal fluency, grammar and composition.

4-5-6. Intermediate Cantonese (3-3-3) I-II-III. Leung
Lecture—3 hours; recitation—1 hour. Prerequisite: course 3 or the equivalent. Continuation of course 1-2-3.

Asian Studies

See Asian American Studies (above); and East Asian Studies

Astronomy

See Physics

Atmospheric Science

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Land, Air and Water Resources.

The Major Program

Atmospheric Science is the study of the physics of meteorological processes, including general circulation of the atmosphere and weather systems; mass and energy transfers at the planetary surface and within the atmosphere; solar and terrestrial radiation; turbulence and diffusion; atmospheric interaction with the biosphere; cloud physics and weather modification; air pollution meteorology; and developments in modern meteorological instrumentation. This field is based on applied mathematical physics, and is strongly relevant to environmental biology and human ecology. Numerous career opportunities exist in the federal and state governments, research and development in the private sector, and education. Examples of career areas are agricultural meteorology, air-pollution forecasting and control, weather modification, hurricane and severe weather forecasting and research, weather satellite meteorology, and numerical weather forecasting. The course of study provides a mathematical and physical science background on which a career can be built in research, education, resource management, or various areas of direct problem solving. In addition to a broad background in meteorology, the major includes a minor area to be chosen from either mathematics, computer science, environmental studies, resource management or a physical or biological science.

Atmospheric Science

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable.)

	UNITS
Preparatory Subject Matter	**68**
Mathematics (Mathematics 21A, 21B, 21C, 22B, 22C and 22A or Statistics 32)	21
Computer science (Engineering 5 or the equivalent in FORTRAN programming)	3
Physics (Physics 8A-8B-8C)	12
Chemistry (Chemistry 1A, 1B)	10
Biological science (Biological Sciences 1, Botany 2 or Zoology 2-2L)	10
English and/or rhetoric (see College requirement, page 71)	8
Meteorology (Atmospheric Science 20-20L)	4
Depth Subject Matter	**30**
Atmospheric Science 110A, 110B, 120, 121A, and 121B	17
Upper division Atmospheric Science courses selected with adviser's approval. If both courses 105 and 133 are taken, only 4 units may be counted toward the 13 elective units in Atmospheric Science.	13
Breadth Subject Matter	**28**
Social sciences and humanities electives†	28
Restricted Electives	**21**
Earth science electives (chosen from Resource Sciences 103, Environmental Studies 116, 150A, Geology 115, 113 or courses approved by adviser)	6
Coordinated group of courses (minor area) to be chosen with Adviser's approval from mathematics, computer science, environmental studies, resource management, or a physical or biological science	15
Unrestricted Electives	**33**
Total Units for the Major	**180**

Major Adviser. J.J. Carroll *(Land, Air and Water Resources).*

Advising Center for the major, as well as for graduate studies, is located in 122 Hoagland Hall, Resource Sciences Teaching Center (752-1669).

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 123.

Graduate Study. You can specialize in particular areas of atmospheric science through graduate study and research leading to the M.S. and Ph.D. degrees. For details see under the Graduate Group in Atmospheric Science which follows and the *Announcement of the Graduate Division.*

Related Courses. See Civil Engineering 149B; Environmental Studies 150A; Geography 3, 115; Physics 104A, 104B; Resource Sciences 103, 131.

Courses in Atmospheric Science

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

20. Introduction to Meteorology (3) I, Shaw
Lecture—3 hours. Prerequisite: Mathematics 16A or the equivalent. Introduction to atmospheric processes and phenomena. Radiation and energy balance of the earth and atmosphere. Analysis of atmospheric motions including atmospheric storms. Condensation in the atmosphere. Atmospheric stability. Principles of modern weather analysis and forecasting.

20L. Introduction to Meteorology Laboratory (1) I, Shaw
Laboratory—3 hours; one or more field trips. Prerequisite: course 20 (preferably taken concurrently). Introduction to meteorological instruments and observations; cloud observation; atmospheric soundings; weather maps and charts; weather forecasting.

92. Atmospheric Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. Paw-U (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

105. Microclimate of Agricultural Systems (3) I. The Staff
Lecture—3 hours. Prerequisite: upper division standing in biological or physical sciences. Energy balance, air and soil temperature, wind, water vapor, carbon dioxide patterns within the microclimate structure. Microclimate modification by windbreaks, frost protection and other methods of energy balance manipulation.

110A. Weather Analysis and Forecasting (4) III. Grotjahn
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 20L, 121B (may be taken concurrently). Thermodynamic variables and processes, kinematic and dynamic processes and their relationship to observed weather. Laboratory work includes thermodynamic diagrams, pressure surface and vertical cross section analyses.

110B. Weather Analysis and Forecasting (4) I, Carroll
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 110A; knowledge of FORTRAN (Engineering 5). Application of dynamic theory to weather systems. Operational forecasting techniques including interpretation of numerical forecasts, local detailed forecasts, tropical meteorology, satellite meteorology and numerical analysis of meteorological data.

120. Atmospheric Thermodynamics and Statics (3) I, Weare
Lecture—3 hours. Prerequisite: Mathematics 22C, Physics 8A, course 20 (may be taken concurrently). Atmosphere at rest: atmospheric composition and structure, thermodynamics of atmospheric gases, thermal properties of dry and moist air, hydrostatic equilibrium and stability criteria, and thermodynamic diagrams in meteorology.

121A. Atmospheric Dynamics (3) II. Myrup
Lecture—3 hours. Prerequisite: course 120. The atmosphere in motion: equations of motion for rotating atmospheres; pressure and density fields and their relations to atmospheric circulations; wave motion in the atmosphere, vorticity. The physical basis of modern numerical methods in meteorology.

121B. Atmospheric Dynamics (3) III. Myrup
Lecture—3 hours. Prerequisite: course 121A. The dynamics of fluid motion in geophysical and laboratory systems: Rossby waves; Helmholtz waves; the effect of turbulence; boundary layers; the Ekman layer. The dynamics of convective motion:

the Rayleigh problem; penetrative convection; convective plumes; cumulus models.

124. Meteorological Instruments and Observations (3) III. Flocchini
Lecture—2 hours; laboratory—3 hours. Prerequisite; course 20; Physics 8B. Modern meteorological instruments and their use in meteorological observations and measurements. Both standard and micrometeorological instruments are included.

125. Atmospheric Physics (3) II. Weare
Lecture—3 hours. Prerequisite: course 120; Physics 8C (may be taken concurrently). Study of physical processes in the atmosphere. Emphasis will be given to microphysics of cloud growth and atmospheric radiation and global energy balance.

133. Biometeorology (4) II. Paw-U
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 and an upper division course in a biological discipline; Mathematics 16B. An introduction to biometeorology and survey of atmospheric and biological interactions. Physical basis for plant, animal and human response and adaptation to short-term and long-term meteorological events. Students who have completed course 105 may receive only two units of credit.

149A. Introduction to Air Pollution (3) I, Carroll, Chang and Raabe (Civil Engineering)
Lecture—3 hours. Prerequisite: Mathematics 22B, 22C; Chemistry 1B; course 121A or Engineering 103A. Examination of physical and technical aspects of air pollution. Emphasis is on geophysical processes and air pollution meteorology as well as physical and chemical properties of pollutants. (Same course as Civil Engineering 149A.)

150. Numerical Weather Prediction (4) I, Grotjahn
Lecture—3 hours; discussion—1 hour. Prerequisite: course 121B and Engineering 5. Numerical techniques and their applications to meteorological problems. Finite differencing and spectral methods, design of forecast models, parameterization of physical processes and predictability. Written computer programs to illustrate these topics.

158. Boundary-Layer Meteorology (4) III. Shaw
Lecture—3 hours; discussion—1 hour. Prerequisite: course 121A. Growth, development and structure of the atmospheric layer directly influenced by the underlying surface and extending to a maximum of about two kilometers under convective conditions. Turbulent diffusion in the boundary layer. The microclimate at and near the ground surface.

192. Atmospheric Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in atmospheric science. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: three upper division units in Atmospheric Science. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: three upper division units in Atmospheric Science and at least an overall B average. (P/NP grading only.)

Graduate Courses

200. Atmospheric Processes (3) I, Carroll, Weare
Lecture—3 hours. Prerequisite: Mathematics 22B-22C; Physics 8C. Advanced phenomenological and physical study of atmospheric structure and processes including radiation, statics, thermal structure and weather phenomena. Accelerated presentation of the major topics covered in Atmospheric Science 20, 110A-110B, 120, and 125. Credit not allowed for students having completed any two of these courses.

210. Atmospheric Physics (3) III. The Staff
Lecture—3 hours. Prerequisite: course 121A and 125 (may be taken concurrently). Selective introduction to the physical processes within the atmosphere. Emphasis will be given to radiative transfer and remote sensing, global atmospheric chemistry, and the physical and dynamic processes in the upper atmosphere.

221. Advanced Atmospheric Dynamics (3) III. Grotjahn
Lecture—3 hours. Prerequisite: courses 121B and 240. Emphasizes recent theoretical work in dynamic meterology. Derivations of filtered equations from the primitive equations; potential vorticity and other conservation laws; linear barotropic and baroclinic instability theory; nonlinear wave-interaction; wave-cyclone life cycles; and related topics. Offered in even-numbered years.

223. Advanced Boundary Layer Meteorology (3) I, Myrup
Lecture—3 hours. Prerequisite: course 158. Conservation equations for turbulent boundary layers; similarity principles; the Reynolds equations; surface layer relationships; resistance law relationships; growth of the boundary layer by entrainment; the marine boundary layer; special topics.

230. Atmospheric Turbulence (3) II. Shaw
Lecture—3 hours. Prerequisite. course 121B or 158. Dynamics and energetics of turbulence in the atmosphere including vorticity dynamics. Statistical description of turbulence; Eulerian and Lagrangian scales, spectral analysis, conditional sampling techniques. Turbulent diffusion; the closure problem, gradient-diffusion and second-order methods. Offered in even-numbered years.

***231. Advanced Air Pollution Meteorology** (3) II. Carroll
Lecture—3 hours. Prerequisite: course 149A. Course emphasizes interrelation between atmospheric processes and air pollutants, primarily: transport and diffusion of primary and secondary pollutants; their effects on local radiation budget, cloud and precipitation formation. Offered in odd-numbered years.

233. Topics in Advanced Biometeorology (3) II. Paw-U
Lecture—2 hours; discussion—1 hour. Prerequisite: course 133 or consent of instructor. Study of current topics in biometeorology focusing on interactions of plants with the weather. Biological energy budgets and adaptations to changes in energy regime. Quantification of weather parameters for optimum biological response. Offered in odd-numbered years.

240. General Circulation of the Atmosphere (3) II. Grotjahn
Lecture—3 hours. Prerequisite: course 121B. Large-scale, observed atmospheric circulations. Energy and momentum balances derived and compared with observations. Theoretical framework developed to synthesize observed features.

***241. Climate Dynamics** (3) III. Weare
Lecture—3 hours. Prerequisite: courses 120, 121A, 121B or the equivalent, Engineering—Applied Science 115 or the equivalent computer programming experience; course 150 recommended. Dynamics of climatic variations, Global and zonal average energy balance models. Parameterizations of radiative transfer, convection, and ocean circulation. Introduction to primitive equation climate models. Offered in even-numbered years.

***250. Meso-Scale Meterology** (3) II. The Staff
Lecture—3 hours. Prerequisite: graduate standing, course 150, a course in partial differential equations; or consent of instructor. The study of weather phenomena with horizontal spatial dimensions between 2.5 and 2500 kilometers. Methods of observational study and numerical modeling of the structure and temporal behavior of these weather systems. Offered in even-numbered years.

290. Seminar (1) I, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: graduate standing in Atmospheric Science or related field. Current developments in selected areas of atmospheric research. Topics will vary according to student and faculty interests. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Atmospheric Science (A Graduate Group)

Roger H. Shaw, Ph.D., Chairperson of the Group (752-1822)

Group Office, 139 Hoagland Hall (752-1406)

Faculty

Includes nineteen faculty members from the Departments of Land, Air and Water Resources, Agricultural Engineering, Civil Engineering, Geography, Physics, the Laboratory for Energy-Related Health Research, and the Division of Environmental Studies.

Graduate Study. The Graduate Group in Atmospheric Science offers both the M.S. and Ph.D. degree programs. The student can place major emphasis on graduate work in one or more of the following fields: air quality meteorology, boundary-layer meteorology, biometeorology, and climate dynamics. In addition, members of the Group offer an option in solar energy in cooperation with Resource Sciences and Agricultural Engineering. The diverse and extensive backgrounds of the faculty allow opportunities for interdisciplinary training and research.

Preparation. The Group encourages applications from all interested students with backgrounds in the physical or natural sciences. Basic qualifications for students entering the Atmospheric Science graduate program include mathematics to the level of vector calculus and differential equations, and one year of college-level physics. Considerable flexibility may be allowed for students with high academic potential, but it is expected that deficiencies in preparatory material and in key undergraduate atmospheric science courses be completed within the first year of graduate study.

Requirements. The M.S. program requirements are 30 units of graduate and upper-division courses (36 units for the non-thesis option) composed of:

At least 18 units of graduate level courses

(a) including Atmospheric Science 210 and 240,

(b) including at least 6 additional units of atmospheric science courses (but not course 200), and

(c) not including Atmospheric Science 290 or 299

At least 6 units of upper-division or graduate level courses in applied mathematics

Two units of Atmospheric Science 290

In addition, a thesis or successful completion of a comprehensive examination is required.

The Ph.D. program requires similar coursework to that described above (36 units beyond the B.S. degree), successful completion of a written/oral Qualifying Examination, and the approval of a meritorious dissertation.

Graduate Adviser. L.O. Myrup *(Land, Air and Water Resources).*

Avian Medicine

See Epidemiology and Preventive Medicine

Avian Sciences

(College of Agricultural and Environmental Sciences)

Ray E. Burger, Ph.D., Chairperson of the Department

Department Office, 109 Asmundson Hall (752-1300)

Faculty

Ursula K. Abbott, Ph.D., Professor
Hans (Johannas) Abplanalp, Ph.D., Professor
Ray E. Burger, Ph.D., Professor
Ralph A. Ernst, Ph.D., Adjunct Lecturer
C. Richard Grau, Ph.D., Professor
Annie J. King, Ph.D., Assistant Professor
F. Howard Kratzer, Ph.D., Professor Emeritus
James R. Millam, Ph.D., Assistant Professor
Frank X. Ogasawara, Ph.D., Professor Emeritus
Kathryn Radke, Ph.D., Assistant Professor
Pran N. Vohra, Ph.D., Professor
Wesley W. Weathers, Ph.D., Professor
Barry W. Wilson, Ph.D., Professor
Wilbor O. Wilson, Ph.D., Professor Emeritus
Allen E. Woodard, M.S., Adjunct Lecturer

NOTE: For key to footnote symbols, see page 123.

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, caged exotic bird management, and basic and applied laboratory research on birds—and a broad knowledge of biological science. You may seek a career in health-oriented research, the teaching of biology, gamebird production, domestic and foreign agricultural extension and advisory services, governmental agencies or a diversified and progressive poultry industry. The flexibility of the program and the close personal interaction between students, faculty, and specialists in the field permit you to play a large role in selecting and designing your own course work. You may specialize in a bachelor's program that qualifies you for a particular job; or you may choose a program to meet other broader intellectual and cultural interests. Independent study, undergraduate research, and work-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, Zoology 2, and/or Plant Science 1 or 2)	15
Chemistry (Chemistry 1A, 1B, 8A and/or 8B)	13
Statistics (Statistics 13)	4
Physics (Physics 1A and 1B)	6
Depth Subject Matter	**51**
Biochemistry (Biochemistry 101A, 101B)	6
Genetics (Genetics 100A, 100B)	6
Nutrition (Avian Sciences 150-150L or Nutrition 110)	5
Physiology (Physiology 110)	5
Laboratory units in above listed subjects	4
Specialized courses related to avian species	25
Breadth Subject Matter	**24**
Written and oral expression (see College requirement, page 71)	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. C.R. Grau.

Advising Center for the major is located in 215 Asmundson Hall (752-1300).

Graduate Study. Further training is available through graduate or professional programs in animal physiology, genetics, nutrition, or veterinary medicine. The M.S. degree is offered in Avian Sciences. For details see under the Graduate Group in Avian Sciences which follows and the *Graduate Announcement.*

Related Courses. See Agricultural Economics 130; Food Science and Technology 120, 120L, 121; International Agricultural Development 102; Nutrition 123; Physiology 117, 117L; Zoology 100, 100L.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

‡A student may take one quarter of work-learn experience for a maximum of 15 units.

Courses in Avian Sciences

Lower Division Courses

11. Applied Avian Biology (3) II. The Staff
Lecture—3 hours. A survey of principles and practices involved in poultry production. Designed for students not specializing in avian sciences.

13. Birds, Man, and the Environment (3) I, Grau, B. W. Wilson
Lecture—2 hours, discussion—1 hour, project requiring minimum 20 hours; field trip. Prerequisite: course in biology recommended. Birds in the world of man; folklore, art, literature, uniqueness, domestication, recreation, game birds, zoos, falconry, endangered species, public health, in research, as food sources.

14. Laboratory in Avian Sciences (1) II. The Staff
Laboratory—3 hours; two Saturday field trips. Prerequisite: course 11 (may be taken concurrently), or course 13. Demonstrations, laboratory practicals and field trips: handling and managing birds; functional anatomy, nutrition, reproduction, incubation, rearing and health.

92. Internship in the Avian Sciences (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: sophomore standing preferred; consent of instructor. Work-learn study on and off campus in poultry, gamebirds or exotic bird production, management and research; or in a business, industry, or agency concerned with these entities. Compliance with Internship Approval Request form essential. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Problems in avian biology; nutrition, breeding, and physiology of poultry/wild birds and their products. (P/NP grading only.)

Upper Division Courses

100. Principles of Avian Sciences (5) II. Weathers in charge
Lecture—4 hours; laboratory—3 hours. Prerequisite: Biological Sciences 1. Aspects of biology (anatomy, physiology, behavior, nutrition, reproduction and genetics) that govern the life of birds. Emphasis on those features of birds, domestic, wild and experimental, which are distinctive.

102. Fertility and Hatchability (4) III. Abbott
Lecture—2 hours; discussion—1 hour; one field trip; report. Prerequisite: course 100, Genetics 100B or 120 and Zoology 100. Analysis of normal avian embryonic development, and reproductive failures resulting from nutritional, genetic and environmental problems. Exploration of the use of avian embryos in research on drugs, pesticides and other contaminants, and in biomedical research.

103. The Avian Egg (1) III. Grau
Lecture—1 hour. Prerequisite: course 11 or 100 or the equivalent, or consent of instructor. Eggs of domestic and wild birds as components of the total reproductive process. Egg formation, structure, composition, appearance, genetic and environmental influences, including pollution. Eggs as foods for embryos and humans. Offered in even-numbered years.

105. Caged Exotic Bird Management (3) I, Grau
Lecture—2 hours; discussion—1 hour. Prerequisite: upper division standing in a biological sciences major; course 100. Cage birds, as an unique set of birds, will be examined with respect to anatomy, behavior, breeding, physiology, nutrition, diseases, history, incubation, space and other environmental needs, and history of use by man. Relationships between poultry and cage bird business will be explored

110. Comparative Avian Microanatomy (4) II. B.W. Wilson
Lecture—2 hours; laboratory—6 hours. Prerequisite: Zoology 2-2L and Physiology 110. Development and aging of specific organs and tissues unique to avian species will be studied in chickens, quail, turkeys and raptors, as well as mutants available at Davis. Comparisons will be made to reptiles and mammals in many cases. Offered in even-numbered years.

115. Biology of Birds of Prey (2) I, Weathers
Lecture—2 hours; two weekend field trips. Prerequisite: course 100. Distribution, behavior, and population dynamics of raptors. Human role in population declines, conservation management, handling, health care, and propagation of captive raptors.

120. Game Bird Production (3) II. Woodard
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100; Animal Science 1 and 2. Introduction to husbandry of popular game bird species kept in captivity. Game bird identification, incubation, housing, brooding and rearing, nutrition, diseases, sanitation and marketing.

130. Poultry Breeding and Genetics (3) I, Abplanalp
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 100 and Animal Genetics 107. Applications of genetic principles in poultry. Action of major genes in the control of morphology, reproduction and disease resistance. Breeding plans and genetic tests for major genes as well as traits with quantitative inheritance.

149. Environmental Management of Poultry (4) III. Ernst
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100. Application of physiological principles to environmental managment of poultry. Discussion of such topics as brooding, disease prevention, recycling, lighting programs, housing design and hatchery management. Offered in odd-numbered years.

150. Nutrition of Birds (3) II. Bohra, Grau
Lecture—3 hours. Prerequisite: Biological Sciences 1, Chemistry 98B, and course 100. 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.

150L. Nutrition of Birds Laboratory (2) II. King
Laboratory—6 hours. Prerequisite: course 150 (may be taken concurrently). Proximate analysis of foods. Energy, vitamin, and mineral determinations; feeding trials.

190. Seminar in Avian Sciences (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: upper division standing in Avian Sciences and consent of instructor. May be repeated three times for credit. (P/NP grading only.)

192. Internship in Avian Sciences (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Work-learn study on and off campus in poultry, gamebirds or exotic bird production, management and research; or in a business, industry, or agency concerned with these entities. Compliance with Internship Approval Request form essential. (P/NP grading only.)

195. Topics in Current Research (1-3) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—variable. Hours will depend on instructor with the number of units being commensurate with time in class. Prerequisite: consent of instructor. Discussion of topics of current interest in avian sciences. May be repeated three times for credit.

197T. Tutoring in Avian Sciences (1-3) I, II, III. The Staff (Chairperson in charge)
Hours and duties vary depending upon course being tutored. Prerequisite: Avian Sciences or related major; advanced standing; consent of instructor. Tutoring of students in lower division avian sciences courses; weekly conference with instructors in charge of course; written critiques of teaching procedures. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Problems in avian biology related to nutrition, breeding, and physiology of poultry/wild birds and their products. (P/NP grading only.)

Graduate Courses

202L. Laboratory in Avian Experimental Embryology and Teratology (4) III. Abbott
Laboratory—twenty-nine consecutive 34-hour days, plus 6 equal sessions—to be arranged. Prerequisite: consent of instructor. 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 even-numbered years.

250. Advanced Poultry Nutrition and Feed Formulation (3) II. Vohra
Lecture—3 hours, including use of computer for least cost formulation. Prerequisite: Nutrition 121 or the equivalent. Nutrient requirements of growing and reproducing poultry as influenced by environmental factors. Evaluation of conventional and nonconventional feedstuffs for dietary energy, protein quality, vitamins, minerals, growth promotants and toxicants. Use of computers for least cost formulations.

260. Topics in Avian Physiological Ecology (2) I, Weathers
Lecture—1 hour; seminar—1 hour. Prerequisite: course 100, and Physiology 110 or Physiological Sciences 101A-101B; senior or graduate standing. Energy and water requirements of captive and free-living birds. Metabolic requirements for growth, maintenance, reproduction, and thermoregulation. Emphasis given to diversity of patterns found in birds and their ecological correlates. Offered in 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.

290C. Research Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate standing and

NOTE: For key to footnote symbols, see page 123.

consent of instructor. Major professors lead research discussions with their graduate students. Research papers are reviewed and project proposals presented and evaluated. Format will combine seminar and discussion. (S/U grading only.)

297T. Supervised Teaching in Avian Sciences (1-4) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. Tutoring of students in lower, upper-division and graduate courses in Avian Sciences; weekly conference with instructor in charge of course; written critiques of teaching methods in lectures and laboratories. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Avian Sciences (A Graduate Group)

Ray E. Burger, Ph.D., Chairperson of the Group

Group Office, 109 Asmundson Hall (752-1300)

Faculty

Consists of members from several departments in the College of Agricultural and Environmental Sciences and the School of Veterinary Medicine.

Graduate Study. The Graduate Group in Avian Sciences offers the M.S. degree program to students who wish to pursue specialized advanced work on avian species. The areas of specialization that may be chosen by the student at present include: nutrition, physiology, reproduction, pathology, toxicology, food products, management, ecology, genetics, comparative incubation, environmental physiology, and cellular and developmental studies using wild and domestic birds as experimental animals. Both master's degree plans, thesis or comprehensive examination, are available.

Preparation. It is expected that the student will have had undergraduate preparation in a field appropriate to the course of study selected. The student will be expected to have had courses in most of the following subjects: statistics, general and organic chemistry, biochemistry, general physics, general biology, genetics, nutrition, physiology, and embryology.

Graduate Adviser. A.E. Woodard *(Avian Sciences)*.

Bacteriology

(College of Letters and Science)

JaRue S. Manning, Ph.D., Chairperson of the Department

Department Office, 156 Hutchison Hall (752-0262)

Faculty

[1]Stanley W. Artz, Ph.D., Assistant Professor
Paul Baumann, Ph.D., Professor
Robert E. Hungate, Ph.D., Professor Emeritus
John L. Ingraham, Ph.D., Professor
Sydney G. Kustu, Ph.D., Associate Professor
JaRue S. Manning, Ph.D., Professor
Allen G. Marr, Ph.D., Professor
John C. Meeks, Ph.D., Assistant Professor
Page Painter, Ph.D., M.D., Visiting Lecturer
Herman J. Phaff, Ph.D., Professor Emeritus *(Food Science and Technology)*
Wiltraud J.C. Pfeiffer, Ph.D., Lecturer *(Bacteriology, Biological Sciences)*
[1]David Pratt, Ph.D., Professor
Martin L. Privalsky, Ph.D., Assistant Professor
Mortimer P. Starr, Ph.D., Professor Emeritus
Mark L. Wheelis, Ph.D., Lecturer

The Major Programs

The undergraduate major programs provide a balance of studies in the biology of bacteria and other microorganisms, together with appropriate courses in mathematics and physical science. Both the Bachelor of Arts and the Bachelor of Science programs are suitable for students who plan to do graduate work in a biological science or who wish a professional career in bacteriology.

Either major is appropriate for students contemplating a career in Medical Technology. Such students are advised to take Veterinary Microbiology 126 and 127, Clinical Pathology 101 and a one-year laboratory course in physics in addition to the courses required for a major in bacteriology.

Students majoring in Bacteriology in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Arts degree is offered only by the College of Letters and Science. The Bachelor of Science degree is offered by both the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Bacteriology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**50-53**
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Chemistry 1A, 1B, 1C, 5, 8A, 8B	25
Statistics 13	4
Mathematics 16A-16B or 21A-21B	6-8
Physics	6
Recommended: Physics 2A, 2B, 2C.	
Depth Subject Matter	**36-39**
Bacteriology 105, 130A; 106-106L or 120-120L or 130B-130L or 177-177L	13-14
Biochemistry 101A, 101B, 101L	11
Genetics 100A-100B or 120	4-6
Additional units from Bacteriology 120, 120L, 106, 106L, 130B, 130L, 177, 177L; Biological Sciences 162; Botany 114, 118, 119; Veterinary Microbiology 127, 128	8
Total Units for the Major	**86-92**

Bacteriology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**50-54**
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Chemistry 1A, 1B, 1C, 5	19
Statistics 13	4
Mathematics 16A, 16B, 16C; or 21A, 21B, 21C	9-12
Physics 2A-2B-2C	9
Depth Subject Matter	**53-57**
Bacteriology 105, 130A; 106-106L or 120-120L or 130B-130L or 177-177L	13-14
Biochemistry 101A, 101B, 101L	11
Chemistry 107A, 107B, 128A, 128B, 128C, 129A	17
Genetics 100A-100B or 120	4-6
Biological Sciences 162 or Veterinary Microbiology 128	3-4
Additional units from Bacteriology 120, 120L, 106, 106L, 130B, 130L, 177, 177L	5
Recommended: Chemistry 108; a course in computer programming.	
Total Units for the Major	**103-111**

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 71

College of Letters and Science students: Refer to page 88 for a description of requirements to be completed in addition to the major.

Major Advisers. J.C. Meeks, W.J.C. Pfeiffer, M.L. Wheelis.

Honors and Honors Program. Contact a major adviser from those listed above.

Teaching Credential Subject Representative. W.J.C. Pfeiffer. See page 99 for the Teacher Education Program.

Graduate Study. The Graduate Group in Microbiology offers programs of study and research leading to the M.A. and Ph.D. degrees in general microbiology, including bacteriology. The offerings of the Department of Bacteriology are augmented by courses and faculty of the Departments of Biochemistry and Biophysics, Botany, Food Science and Technology, Genetics, Viticulture and Enology, and the Schools of Medicine and of Veterinary Medicine. For detailed information regarding graduate study in microbiology, address the Chairperson, Graduate Group in Microbiology, Department of Bacteriology.

Related Courses. For other courses related to Bacteriology see course offerings in the Departments of Biological Sciences, Botany, Epidemiology and Preventive Medicine, Food Science and Technology, Medical Microbiology, Plant Pathology, Veterinary Microbiology.

Faculty of the Department of Bacteriology also teach or participate in the following courses: Biological Sciences 1, 162, Food Science and Technology 106; Veterinary Microbiology 128.

Courses in Bacteriology

Lower Division Courses

2. General Bacteriology (3) I, Painter, Marr; II, The Staff; III, Pfeiffer
Lecture—3 hours. Prerequisite: Biological Sciences 1. The biology of bacteria with some of its applications.

3. Bacteriological Laboratory Techniques (1) I, II, III. Pfeiffer
Laboratory—3 hours. Prerequisite: Biological Sciences 1 Designed to acquaint student with basic techniques of bacteriology, with major responsibility for organizing and accomplishing work resting with student. (P/NP grading only.)

10. Biology of the Bacteria (3) III. Wheelis
Lecture—3 hours. Survey of the diversity of bacteria—their metabolism, genetics, and habitats. Emphasis on importance to man—role of bacteria in global element cycles, in food production and in disease. Intended for students who are not majoring in the natural sciences.

98. Directed Group Study (1-5) I, II, III. The Staff (Manning in charge)
Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

102. General Bacteriology (4) I, Baumann, Kustu; II, The Staff
Lecture—4 hours. Prerequisite: Biological Sciences 1 and Chemistry 8B; Mathematics 16A recommended. Biology of bacteria and bacterial viruses. Survey course dealing with the physiology, genetics, and taxonomy of bacteria and their relation to man. Students who have had course 2 may receive only 2 units of credit for this course.

105. Bacterial Diversity: Morphology, Systematics, Habitats (5) I, Pfeiffer, Wheelis
Lecture—3 hours; laboratory—6 hours. Prerequisite: courses 2 or 102, and 3; Chemistry 8B (or 128A and 129A). Major groups of prokaryotic organisms, with particular emphasis on morphology and natural history. Isolation of bacteria from various habitats by enrichment culture techniques.

***106. Bacterial Diversity: Metabolism Physiology** (3) II. Baumann
Lecture—3 hours. Prerequisite: course 105, Biochemistry 101B (may be taken concurrently). Metabolic and phys-

NOTE: For key to footnote symbols, see page 123.

iological bases of prokaryotic diversity with particular emphasis on aerobic and anaerobic energy-yielding metabolism and the utilization of comparative biochemistry for classification of prokaryotes.

***106L. Laboratory in Physiological Basis of Bacterial Diversity** (2) II. Baumann
Laboratory—6 hours. Prerequisite: course 106 (may be taken concurrently). Practical experience in isolation and characterization of prokaryotes using a number of different analytical methods. Offered in even-numbered years.

110. Bacteriology of Insects (3) II. Baumann
Lecture—3 hours. Prerequisite: course 2 or 102; Biochemistry 101A or Physiological Sciences 101A . Physiological basis of pathogenic and symbiotic associations between prokaryotes and insects. Taxonomy, physiology, pathogenesis and molecular biology of insect pathogens. Insect immunity. Nutritional associations between microorganisms and insects. Pertinent entomological background information will be included in the lectures.

110L. Bacteriology of Insects Laboratory (2) II. Baumann
Laboratory—6 hours. Prerequisite: courses 3 and 110 (may be taken concurrently). Practical experience in the isolation, cultivation, physiology, genetics and taxonomy of selected insect pathogens. Bioassay of toxins and observations on the mechanisms of pathogenesis.

120. Microbial Ecology (3) III. Meeks
Lecture—3 hours. Prerequisite: course 105; Biochemistry 101A. Interactions between non-pathogenic microorganisms and their environment, emphasizing physiological and metabolic characteristics of various groups and their adaptation to and modification of specific habitats.

120L. Microbial Ecology Laboratory (2) III. Meeks
Laboratory—6 hours; one optional overnight weekend field trip. Prerequisite: course 120 (may be taken concurrently); consent of instructor. Study of prokaryotic microorganisms from certain habitats. One-half of laboratory effort will consist of organized experiments on ecologically important microbial activities. For remaining one-half, research projects will be done on student selected specific habitats of microorganisms. Limited enrollment.

130A. Bacterial Physiology and Genetics (3) II. Ingraham
Lecture—3 hours. Prerequisite: course 2 or 102; Biochemistry 101B (may be taken concurrently); Genetics 100A; Mathematics 16A. The physiology and regulation of bacterial growth including the effect of the environment. Mapping techniques and the use of mutants in problem solving.

130B. Bacterial Physiology and Genetics (3) III The Staff
Lecture—3 hours. Prerequisite: course 130A. Gene regulation. Prokaryotic nitrogen metabolism. Structure and function of the bacterial cell envelope; synthesis of peptidoglycan and lipopolysaccharide; active transport of nutrients; chemotaxis.

130L. Bacterial Physiology Laborstory (3) III. The Staff
Laboratory—6 hours. Prerequisite: courses 3, 130A. Physiology and genetics of bacteria and bacterial viruses. Isolation and characterization of mutant strains. Mapping of mutations by conjugation and transduction. Studies on control of enzyme synthesis by induction, repression and catabolic repression.

***177. Metabolism of Anaerobic Bacteria** (3) II. Macy (Animal Science)
Lecture—3 hours. Prerequisite: course 2 or 102; Biochemistry 101B (may be taken concurrently). Various groups of anaerobic and facultatively anaerobic bacteria, a consideration of their natural environments and their metabolic characteristics, with emphasis on energy yielding catabolic pathways.

***177L. Laboratory in Metabolism of Anaerobic Bacteria** (2) II. Macy (Animal Science)
Laboratory—6 hours. Prerequisite: courses 3, 177 (may be taken concurrently). Isolation of anaerobic bacteria from a number of different natural environments; experiments dealing with certain characteristic physiological and metabolic aspects of anaerobic bacteria. Offered in odd-numbered years.

190C. Undergraduate Research Conference (1) I, II, III. The Staff (Manning in charge)
Discussion/conference—1 hour. Prerequisite: upper division standing; consent of instructor. Presentation and critical discussion of staff research activities: designed for advanced undergraduate students. May be repeated for a maximum of 3 units of credit when subject matter differs. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Technical and/or professional experience on or off campus. Supervised by a member of the Bacteriology Department faculty. (P/NP grading only.)

197T. Tutoring in Bacteriology (1-5) I, II, III. The Staff (Chairperson in charge)
Tutoring—1-5 hours. Prerequisite: course 3, and 18 upper division units in Bacteriology; consent of chairperson. Assist in undergraduate laboratory courses supervised by teaching assistants or faculty; in discussion sections supervised by faculty; and staffing "drop-in" offices for individual help. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A-200B-200C. Microbiology for First-Year Graduate Students (3-3-3) I-II-III. The Staff (Manning in charge)
Lecture—3 hours. Prerequisite: first-year graduate standing with interest in Bacteriology. A survey of general microbiology at the graduate level.

***210. Comparative Studies of Prokaryotes** (3) II. Baumann
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: courses 105, 130A; Biochemistry 101A-101B or the equivalent. Consideration of the various methods used to establish relationship among prokaryotes and their application to selected bacterial groups. Significance of the results with respect to bacterial evolution and classification. Offered in odd-numbered years. Limited enrollment.

215. Recombinant DNA (2) I, Privalsky
Lecture—2 hours. Prerequisite: courses 130A-130B or Biochemistry 101A-101B; Genetics 100A, 100B, 102 (may be taken concurrently). Application of the recombinant DNA technology to modern problems in biology, biochemistry and genetics, emphasizing molecular cloning strategies, choice of vectors, preparation of insert DNA and selection procedures.

215L. Recombinant DNA Laboratory (4) I, Privalsky
Discussion—1 hour; laboratory—9 hours. Prerequisite: course 130L or Biochemistry 101L; Genetics 100L and 102 (may be taken concurrently); or consent of instructor. Application of the recombinant DNA technology to modern problems in biology, biochemistry and genetics, emphasizing molecular cloning strategies, choice of vectors, preparation of insert DNA and selection procedures.

240. Biology of Autotrophic Prokaryotes (3) I, Meeks, Wheelis
Lecture-discussion—3 hours. Prerequisite: Biochemistry 101B. Biochemistry and ecology of photo- and chemoautrophic bacteria, and of methylotrophic bacteria, with special emphasis on the mechanisms of ATP and reductant generation. Offered in even-numbered years.

***250. Yeasts and Related Organisms** (5) I, Phaff, Miller
Lecture—3 hours; laboratory—6 hours. Prerequisite: consent of instructor. Morphology, development, classification, and distribution of yeasts, relation to other fungi; growth requirements; physiological activities. Offered in odd-numbered years.

***260. Bacterial Genetic Regulatory Mechanisms** (3) II. Artz
Lecture-discussion—3 hours. Prerequisite: general knowledge of nucleic acid biochemistry and bacterial genetics. Analysis at the molecular level of genetic regulation in selected bacterial systems. Specific systems discussed will include the following types of regulation: control of transcription initiation and termination; translational controls; tRNA modification effects; autoregulation; control circuits in bacterial viruses; supercontrols. Offered in even-numbered years.

***270. Advanced Animal Virology** (3) III. Manning
Lecture—3 hours. Prerequisite: consent of instructor. Selected advanced topics on biological and biochemical properties of animal viruses. May be repeated for credit. Offered in even-numbered years.

290C. Advanced Research Conference (1) I, II, III. The Staff (Manning in charge)
Discussion/conference—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and critical discussion of staff research activities. Designed for advanced graduate students. May be repeated for credit. (S/U grading only.)

291. Selected Topics in Bacteriology (1) I, II, III. The Staff (Manning in charge)
Seminar—1 hour. Current progress in bacteriology and cellular and molecular biology. (S/U grading only.)

292. Seminar in Bacterial Physiology, Genetics and Virology (1) I, Baumann; II, Meeks; III,———
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in bacterial physiology, genetics, and virology with presentations by individual students. (S/U grading only.)

296. Seminar in Animal Virology (1) II. Manning
Seminar—1 hour. Prerequisite: consent of instructor. Discussion of current topics in animal virology. (S/U grading only.) (Same course as Veterinary Microbiology 292.)

298. Group Study (1-5) I, II, III. The Staff (Manning in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Manning in charge)
(S/U grading only.)

Behavioral Biology

See Medicine

Biochemistry

(College of Agricultural and Environmental Sciences)

The Major Program

The Biochemistry major introduces students to the chemistry of living organisms and the experimental techniques that are used to probe the structures and functions of biologically-important molecules. Because the programs focus on the molecular basis of life processes, it is suitable for students interested in pursuing graduate studies or professional careers in a wide variety of contemporary biological sciences. These include basic research (e.g., biochemistry, cell biology, molecular genetics, biotechnology, human or veterinary medicine and dentistry, and biology-chemistry teaching). Students who enjoy both chemistry and biology and who are comfortable with quantitative approaches to problem solving will find biochemistry a fruitful field of study.

Choice of College.

The Bachelor of Science degree is offered by both the College of Agricultural and Environmental Sciences and the College of Letters and Science. Students majoring in Biochemistry in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis. Students in the College of Agricultural and Environmental Sciences must accumulate 54 units of upper division courses to graduate. Further information can be obtained from the Division of Biological Sciences Office, 171 Mrak Hall.

Biochemistry

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**49-58**
Biological sciences: Biological Sciences 1 and at least one course from Bacteriology 2-3 or 102-3, Botany 2, or Zoology 2-2L	9-11
Chemistry 1A-1B-1C, 5; or 4A-4B-4C (students may start with Chemistry 4A and continue with 1B-1C but not vice versa)	15-19
Mathematics 16A-16B-16C or 21A-21B-21C and one additional course in statistics (e.g., Statistics 13, 102, or 130A)	13-16
Physics, 12 units minimum (Physics 2A-2B-2C and 3A-3B-3C, or 8A-8B-8C)†	12
Depth Subject Matter	**39-41**
Biochemistry 101A-101B, 101L	11
Genetics 100A-100B or 120	4-6
Organic chemistry: Chemistry 128A-128B-128C, 129A-129B-129C	15

NOTE: For key to footnote symbols, see page 123.

Physical chemistry: Chemistry 107A-107B-108 or 110A-110B-110C 9

Breadth Subject Matter **32**
College of Agricultural and Environmental Sciences students:
English 1, 2, 20, or 103; plus 4 additional units from the above or from English 3, 104, Rhetoric 1, 3, Comparative Literature 1, 2, 3, Philosophy 5 or 10 8

Social sciences and humanities (including foreign languages and additional English and rhetoric courses)‡ 24

College of Letters and Science students:
Refer to page 88 for a description of the options available in meeting the 32-unit requirement.

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 other than biochemistry.

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 **34-44**

Total Units for the Major **180**

Major Adviser. L. Sprechman *(Biochemistry and Biophysics).*

Advising Center for the major is located in 150 Mrak Hall (752-0410).

Graduate Study. See page 94, and under Biochemistry (A Graduate Group), below.

Courses. See under Biochemistry and Biophysics.

Biochemistry (A Graduate Group)

Harry R. Matthews, Ph.D., Chairperson of the Group

Group Office, 149 Briggs Hall (752-3611)

Graduate Study. The Graduate Group in Biochemistry offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information regarding graduate study, address the chairperson of the group.

Graduate Advisers. G.E. Bruening *(Biochemistry and Biophysics),* H. R. Matthews *(Biological Chemistry).*

Courses in Biochemistry

Graduate Courses

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

†Physics 8D is optional. Students electing the Physics 8 sequence should elect Mathematics 21A-21B-21C and 22A-22B-22C.

Biochemistry and Biophysics

(College of Agricultural and Environmental Sciences)

John R. Whitaker, 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., Professor
Roy H. Doi, Ph.D., Professor
Marilynn E. Etzler, Ph.D., Professor
Jerry L. Hedrick, Ph.D., Professor
Lloyd L. Ingraham, Ph.D., Professor
J. Clark Lagarias, Ph.D., Assistant Professor
Mark G. McNamee, Ph.D., Associate Professor
Jack Preiss, Ph.D., Professor
Irwin H. Segel, Ph.D., Professor
Larry R. Sprechman, Ph.D., Visiting Lecturer
Paul K. Stumpf, Ph.D., Professor Emeritus
Merna R. Villarejo, Ph.D., Associate Professor
John R. Whitaker, Ph.D., *(Biochemistry and Biophysics, Food Science and Technology)*

Major Programs and Graduate Study. See the major in Biochemistry (page 150); and for graduate study see page 94, and the Graduate Group in Biochemistry, 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. Criddle, Etzler, Lagarias, McNamee, Sprechman, Villarejo
Lecture—3 hours. Prerequisite: Chemistry 8B or 128B. Introduction to the chemistry and metabolism of biologically important compounds; dynamic aspects of biochemistry with examples from animals, plants and microorganisms.

101B. General Biochemistry (3) I, II, III. Conn, Doi, Preiss, Segel, Sprechman
Lecture—3 hours. Prerequisite: course 101A. Continuation of 101A.

101L. General Biochemistry Laboratory (5) I, II, III. Bruening, Chaykinj, Sprechman
Lecture—2 hours; laboratory—10 hours. Prerequisite: course 101B (may be taken concurrently); Chemistry 5. Introduction to laboratory methods and procedures employed in studying biochemical processes. Designed for students who require limited experience in the use of biochemical techniques as laboratory tools.

120L. Advanced Undergraduate Laboratory (3) II. Sprechman
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 101L and consent of instructor. Advanced biochemical laboratory methods and procedures including some of the more recent technological advances. Experiments include techniques from areas such as immunochemistry, nucleic acid manipulation and sequencing, high performance liquid chromatography, and membrane biochemistry.

122. Plant Biochemistry (3) II. Conn, Lagarias
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
Lecture—3 hours. Prerequisite: course 101B. Principles of physical, chemical and catalytic properties of enzymes and their utilization. Experimental determination and quantitative evaluation of influence of reaction conditions on activity are stressed. Specificity and mechanism of action illustrated by consideration of selected enzymes.

123L. Enzymology Laboratory (2) III. Whitaker
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 101B; course 123 (concurrently). Laboratory procedures involved in separation and study of enzymes.

133. Behavior and Analysis of Enzyme Systems (3) III. Segel
Lecture—3 hours. Prerequisite: courses 101A and 101B. Introduction to enzyme kinetics and varieties of enzyme behavior, with emphasis on metabolic regulation. Topics include: steady-state kinetics, patterns of feedback inhibition, control by enzyme activation, allosteric enzymes, multireactant systems, enzyme assays, and membrane transport.

143. Structure-Function Relations of Proteins (3) I, Criddle, Villarejo
Lecture—3 hours. Prerequisite: courses 101A, 101B; and 101L (may be taken concurrently). Correlation of structure and biological function. Molecular models of enzymes that explain their physiological functioning. Physical and chemical methods used in determining protein structure. Function as measured by kinetic and binding models and as affected by physiological considerations.

153. Biosynthesis of Informational Macromolecules, Mechanisms and Regulation (3) II. Dahmus
Lecture—3 hours. Prerequisite: course 101B; Genetics 100A. Chromosome structure and function in prokaryotic and eukaryotic systems. Mechanisms of nucleic acid and protein synthesis with special emphasis on regulation. Regulation at multicellular level; development, immune system and carcinogenesis.

190. Undergraduate Seminar in Biochemistry (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: courses 101A, 101B (may be taken concurrently). Discussion of the historical developments of modern biochemistry.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Technical and/or practical experience on and off campus, supervised by a member of the Biochemistry and Biophysics faculty. (P/NP grading only.)

197T. Tutoring in Biochemistry (1-5) I, II, III. The Staff (Chairperson in charge)
Discussion—1-5 hours. Prerequisite: upper division standing and consent of instructor. To assist the instructor by tutoring students in one of the department's regular courses. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201A. Physical and Chemical Biochemistry (4) I, Bruening, Ingraham
Lecture—4 hours. Prerequisite: course 101B; Chemistry 107B-108 or 110C; 128C, 129C. Biochemical thermodynamics and chemical and physical properties of biomacromolecules, including enzyme kinetics and methods for determining size and shape of macromolecules.

201B. Metabolism and Bioenergetics (3) II. Chaykin
Lecture—3 hours. Prerequisite: course 201A. Intermediary metabolism of amino acids, nucleotides, lipids and carbohydrates; biological oxidation reduction reactions; photosynthesis and oxidative phosphorylation; roles of vitamins in metabolism; catalytic strategies of biosynthesis and biodegradation.

201C. Molecular Biology (3) III. Hershey (Biological Chemistry), Dahmus, Doi, Bradbury (Biological Chemistry)
Lecture—3 hours. Prerequisite: course 201B. Structure and organization of DNA and chromatin; DNA replication, repair and modification; transcription and RNA processing; protein biosynthesis and turnover; transcriptional and post-transcriptional control mechanisms; examples of the above from eukaryotic and prokaryotic cells and viruses.

201D. Integration of Metabolism and Regulatory Phenomena (3) II. Preiss, Freedland (Physiological Sciences), Walsh (Biological Chemistry)
Lecture—3 hours. Prerequisite: course 201B. Comprehensive discussion of regulatory phenomena that occur in control of metabolism; e.g., regulation at enzyme level; integration of metabolic pathways including homeostasis, hormonal influences, turnover of enzymes, comparative aspects of metabolism, regulation of amino acids and lipid metabolism in living systems. Offered in odd-numbered years.

201E. Cellular Biochemistry (3) I, McNamee
Lecture—3 hours. Prerequisite: course 201A. Structure and function of cell membranes and cell surface components with emphasis on biochemical principles involved in cell growth, cell development and cell-cell interactions. Biochemical aspects of some differentiated systems, such as the immune system.

NOTE: For key to footnote symbols, see page 123.

202A-202B. Advanced Biochemical Methods (1-1) I-II. Lagarias, Doi
Lecture—1 hour. Prerequisite: course 201A (may be taken concurrently), and 101L or the equivalent. Laboratory methods and procedures used in biochemical research. Current laboratory methods and procedures used in cell fractionations, enzymology, protein carbohydrates, lipid, and nucleic acid chemistry and immunology. (S/U grading only.)

202L. Advanced Biochemistry Laboratory (5) I, II, III. Graduate Group Staff (Lagarias, Doi in charge)
Laboratory—15 hours. Prerequisite: course 201A (may be taken concurrently), and 101L or the equivalent. Two five-week placements in biochemical research laboratories. Assigned individual research problem with emphasis on technical experience and experimental design. May be repeated twice for credit. (S/U grading only.)

203. Carbohydrates (3) III. Preiss
Lecture—2 hours. Prerequisite: course 201B. Chemistry, metabolism, and biological functions of the various classes of carbohydrates and their polymers. Biosynthesis of simple and complex sugars and polysaccharides. Offered in even-numbered years.

204. Selected Topics in Nucleic Acids and Molecular Biology (2) II. Bruening, Dahmus, Doi
Lecture—1 hour; discussion—1 hour. Prerequisite: course 201C; consent of instructor. Relation of structure and function of RNA and DNA to heredity, coding, and protein synthesis. Each offering will consist of a topic selected from rapidly advancing areas of nucleic acid biochemistry and molecular biology. May be repeated for credit when different topic is studied. (S/U grading only.)

205. Biochemical Mechanisms (3) II. Ingraham
Lecture—3 hours. Prerequisite: course 101B or consent of instructor; Chemistry 110C, 131. Bond structure of biochemical interest. Application of modern organic and inorganic chemical principles to a study of the mechanisms of biochemical reactions.

208. Membrane Biochemistry (2) II. McNamee, Villarejo
Lecture—2 hours. Prerequisite: course 201E. Advanced topics in membrane biochemistry with emphasis on the structure and function of membrane proteins and lipids. Offered in even-numbered years.

210. Protein Biochemistry (3) II.
Lecture—3 hours. Prerequisite: course 201C. Chemical, physical, and biological properties of amino acids, peptides, and proteins. The biological aspects include protein function, biosynthetic and biodegradative pathways, and nutritional requirements for amino acids.

212. Chemical Modifications of Proteins (3) II. Benisek (Biological Chemistry)
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. Offered in even-numbered years.

215. Kinetics of Biological Systems (2) III. Ingraham
Lecture—2 hours. Prerequisite: course 201B; Fortran IV (may be taken concurrently). Kinetic behavior of multivariable biological systems; mathematical methods and analysis of typical data with accent on computer use; in particular, the kinetics of multivariant catalysts, pre-steady state systems, perturbed systems, and reactions in a metabolic sequence. Offered in even-numbered years.

240. Selected Topics in Biochemistry (2) II. The Staff
Seminar—1 hour. Prerequisite: course 201C or consent of instructor. (S/U grading only.)

250. Biochemical Literature (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Critical reading and evaluation of current biochemical literature. Selected papers will be presented and discussed in detail. (S/U grading only.)

270. Advanced Research Conference (1) I, II, III. Hedrick
Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Presentation and critical discussions of research activities of various members of local biochemical community; primarily designed for graduate students. (S/U grading only.)

291. Current Progress in Biochemistry (1) I, II, III. Hedrick
Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Seminars presented by guest lecturers on subject of their own research activities. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. Directed group study of special topics in biochemistry. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Course

390. The Teaching of Biochemistry (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate student in Biochemistry; consent of instructor. Practical experience in methods and problems of texts and supporting material, discussion of teaching techniques, preparing for and conducting discussion sessions, observing and guiding student laboratory work, formulation of topics and questions for examinations under supervision of instructor. Participation in the teaching program required for Ph.D. degree. May be repeated for credit. (S/U grading only.)

Biological Chemistry

See Medicine

Biological Sciences

(Intercollege Division)

Donald L. McLean, Ph.D., Dean, Division of Biological Sciences

Armand R. Maggenti, Ph.D., Associate Dean

Division Office, 171 Mrak Hall (752-0410)

Faculty

Faculty includes members from departments of Animal Physiology, Bacteriology, Biochemistry and Biophysics, Botany, Genetics, and Zoology; and academic advisers for divisional majors and instructors of upper division courses in curricula of divisional majors.

Kathleen M. Fisher, Ph.D., Associate Professor *(Biological Sciences, Education)*
Wiltraud J.C. Pfeiffer, Ph.D., Lecturer *(Biological Sciences, Bacteriology)*

Programs of Study

The Division of Biological Sciences is an intercollege unit which coordinates the teaching and research of the departments of Animal Physiology, Bacteriology, Biochemistry and Biophysics, Botany, Genetics, and Zoology. Four majors leading to an A.B. degree are offered in Biological Sciences, Bacteriology, Botany, and Zoology. Seven majors are offered within the Division leading to a B.S. degree in disciplines of the six above-named departments, and in Biological Sciences. The major programs are described under the respective departmental listings, except for the majors in Biological Sciences (outlined below).

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, may be best served by the Bachelor of Arts program; for those interested in a more laboratory-oriented area, the Bachelor of Science program is more suitable.

Students majoring in Biological Sciences in the *College of Letters and Science* may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Arts degree is offered only by the College of Letters and Science. The Bachelor of Science degree is offered by both the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Biological Sciences

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**42-48**
Bacteriology 2 or 102, 3	4-5
Biological Sciences 1	5
Botany 2	5
Zoology 2-2L	6
Chemistry 1A, 1B	10
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Mathematics and/or statistics	6

Recommended:
Chemistry 1C; Physics 2A, 2B, 2C; a course in computer programming.

Depth Subject Matter	**36**
Genetics 100A-100B or 120	4-6
Restricted Electives	30–32

Upper division biological sciences courses to include:
(1) a minimum of 2 units or 6 (quarter) hours of laboratory classes,
(2) at least 3 units from each of the three Area requirements: animal biology, microbiology, and plant biology (see "Course List for Area Requirement" section following the B.S. major requirements. The lists apply to both the A.B. and B.S. majors.), and
(3) at least one course from each of the five Group Requirement lists, (a) through (e) following.

Note: A course that appears on both the Area and Group Requirement lists may be used toward satisfying both requirements. Both halves of sequential courses connected by a hypen must be taken.

Course List for Group Requirement
(a) *Organismal Biology:* Bacteriology 105; Biological Sciences 162; Botany 102, 105, 108, 114, 118, 119; Entomology 101A, 101B, 103; Veterinary Microbiology 127, 128; Zoology 100, 105, 106, 112, 133A, 133B, 136, 137.
(b) *Population Biology and Ecology:* Anthropology 154A; Bacteriology 120; Botany 117, 141; Entomology 104; Environmental Studies 100, 121; Genetics 105; Geology 116, 150C; Wildlife and Fisheries Biology 110, 151; Zoology 125.
(c) *Evolutionary Biology:* Anthropology 151, 152; Botany 100, 116, 140; Genetics 103; Geology 107; Plant Science 103; Zoology 148.
(d) *Physiology:* Bacteriology 130A-130B; Botany 111A-111B; Physiology 110; Plant Pathology 130; Zoology 142, 143.
(e) *Biochemistry and Cell Biology:* Biochemistry 101A-101B; Botany/Zoology 130; Physiological Sciences 101A-101B; Physiology 100A-100B; Veterinary Microbiology 126; Zoology 121A, 121B.

Total Units for the Major	**78–84**

Breadth Subject Matter
College of Letters and Science students:
Refer to page 88 for a description of requirements to be completed in addition to the major.

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 16A, 16B, 16C	9
Physics 2A-2B-2C	9
Statistics 13 or 102	4
Zoology 2-2L	6

Recommended: Chemistry 5, Physics 3A, 3B, 3C; a course in computer programming.

Depth Subject Matter	**45**

NOTE: For key to footnote symbols, see page 123.

Biochemistry 101A-101B or Physiological Sciences 101A-101B 6-7
Genetics 100A-100B or 120 4-6
Restricted Electives 32–35
Upper division biological sciences courses to include:
(1) a minimum of 2 units or 6 (quarter) hours of labortory classes,
(2) at least 7 units from each of the three Area Requirement lists: animal biology, microbiology, plant biology (see "Course List for Area Requirement" section below following the total units. The lists apply to both the A.B. and B.S. majors.), and
(3) at least one course from each of the five Group Requirement lists, (a) through (e) following.

Note: A course that appears on both the Area and Group Requirement lists may be used toward satisfying both requirements. Both halves of sequential courses connected by a hyphen must be taken.

Course List for Group Requirement

(a) *Organismal Biology:* Bacteriology 105; Biological Sciences 162; Botany 102, 105, 108, 114, 118, 119; Entomology 101A, 101B, 103; Veterinary Microbiology 127, 128; Zoology 100, 105, 106, 112, 133A, 133B, 136, 137.
(b) *Population Biology and Ecology:* Anthropology 154A; Bacteriology 120; Botany 117, 141 ; Entomology 104; Environmental Studies 100, 121; Genetics 105; Geology 116, 150C; Wildlife and Fisheries Biology 110, 151; Zoology 125.
(c) *Evolutionary Biology:* Anthropology 151, 152; Botany 100, 116, 140; Genetics 103; Geology 107; Plant Science 103; Zoology 148.
(d) *Physiology:* Bacteriology 130A-130B; Botany 111A-111B; Physiology 110; Plant Pathology 130; Zoology 142, 143.
(e) *Biochemistry and Cell Biology:* Biochemistry 133, 143, 153; Botany/Zoology 130; Genetics 102A; Medical Microbiology 107; Physiology 100A-100B; Veterinary Microbology 126; Zoology 121A, 121B, 121C.

Total Units for the Major 108–114

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 page71.
College of Letters and Science students: Refer to page 88 for a description of requirements to be completed in addition to the major.

Course List for Area Requirement

(a) Animal Biology: Anatomy 100; Anthropology 151, 152, 153, 154A, 155, 156; Avian Sciences 100; Entomology 101A, 101B, 103, 104, 106, 109, 116, 119, 121, 123, 125, 153; Geology 111A; Human Anatomy 101; Nematology 110; Wildlife and Fisheries Biology 110, 111, 120, 140, 151; Zoology 100, 105, 106, 112, 125, 133A, 133B, 136, 137, 138, 139, 147, 148, 149, 155.
(b) Microbiology: Bacteriology—all upper division courses; Biological Sciences 162; Botany 114, 118, 119; Entomology 140, 156; Geology 111B; Medical Microbiology 107; Plant Pathology 120, 130; Veterinary Microbiology 126, 127, 128, 132.
(c) Plant Biology: Botany 100, 101, 102, 105, 108, 111A,111B, 114, 116, 117, 118, 119, 121, 122, 140, 141, 142, 143; Environmental Horticulture 105, 107; Plant Science 101, 103; Range Science 100; Resource Sciences 110; Vegetable Crops 105.

Note: *Botany 114, 118, or 119 may be used for either microbiology or plant biology (not both). Bacteriology 102 (when taken in place of Bacteriology 2) will not count toward the upper division unit requirement in the major, but will fulfill the microbiology Area requirement.*

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.

There is a limitation of variable-unit courses which may be counted toward the major. Of these courses, up to 6 units of 199 courses may be counted, and no units of 197T courses may be counted.

Major Advisers. Contact Division Office for adviser assignments.

Honors and Honors Programs. Students who have met the minimum grade-point average and the units-completed criteria, and who have obtained a sponsoring faculty supervisor may elect to participate in the Biological Sciences Honors Program. The program entails completion of a research project and honors thesis through enrollment in course 194H.

The Division of Biological Sciences also confers Citations of Outstanding Performance on undergraduates majoring in Biological Sciences who have demonstrated superior academic performance and individual achievement in research. Students who wish to be considered for a Citation must first meet or exceed a specified grade-point average and participate in an appropriate research project.

The Division additionally recommends students in the Biological Sciences major to the College of Letters and Science for the purpose of awarding Highest Honors at graduation. To be eligible for a positive recommendation, a student must complete a stipulated number of upper-division units required in the major for a letter grade and meet or exceed a specified grade-point average.For further details on the above programs and awards, contact the Division Office.

Minor Program Requirements:

The minor in Biological Sciences is designed to acquaint students with the range and variety of modern biology, including work in two of three areas: animal biology, plant biology, and microbiology, and in four of the following five subdisciplines: organismal biology, ecology, evolution, physiology, and biochemistry and cell biology. The list of required courses is restricted to those which are acceptable for the major program in Biological Sciences but which do not require extensive upper division preparatory work; substitutions of more advanced courses can be made, as appropriate, with the approval of an adviser for the minor.

Information on certification of completion of the minor program can be obtained from the Division Office.

	UNITS
Biological Sciences	**22-24**
Genetics 120 or 100A-100B	4-6
Additional upper division units to include	18

Area Requirements
Courses in two of three areas: Animal Biology, Microbiology, and Plant Biology. An extensive list of courses which will satisfy area requirements can be found under the Biological Sciences major program description above. *(Courses can be used to simultaneously satisfy both the area and group requirements.)*

Group Requirements
At least one course or course sequence must be selected from four of the following five groups
(a) *Organismal biology:* Bacteriology 105, Botany 102, 105, 114, Zoology 100, 106, 112, 136, 137
(b) *Ecology:* Anthropology 154A, Botany 101, Environmental Studies 100, Geology 116, Wildlife and Fisheries Biology 151, Zoology 125
(c) *Evolution:* Anthropology 151, Botany 116, 140, Genetics 103, Geology 107, Zoology 148, 149
(d) *Physiology:* Botany 111A-111B, Physiology 110
(e) *Biochemistry and cell biology:* Biochemistry 101A-101B, Botany/Zoology 130, Physiology 100A-100B, Zoology 121A, 121B.

Minor Adviser. Same as for major.

Teaching Credential Subject Representative. Associate Dean (Biological Sciences). See page 98 for the Teacher Education Program.

Courses in Biological Sciences

Lower Division Courses

1. Principles of Biology (5) I. Thornton (Botany); II. Pfeiffer (Biological Sciences, Bacteriology), Fisher (Biological Sciences, Education); III. Wolfe (Zoology)
Lecture—4 hours OR lecture—2 hours plus autotutorial—2 hours: laboratory—3 hours. Prerequisite: Chemistry 1B. An interdisciplinary course designed for majors in the biological sciences. The emphasis is on the unity of basic biological principles as related to cell structure and function, reproduction, genetics, evolution, and ecology.

10. General Biology (4) I. Jameson (Zoology): II, ——— (Botany)
Lecture—3 hours; discussion—1 hour. Consideration of the main features and principles of biology, with emphasis on biological processes and special reference to evolution, heredity, and the bearing of biology on human life. Designed for students not specializing in biology. Not open for credit to those who have had course 1.

19. Biology of Cancer (3) III. Pfeiffer (Biological Sciences, Bacteriology)
Lecture—3 hours. Prerequisite: either course 1 or 10, or Genetics 10, or Physiology 10 recommended. Interdisciplinary course offers an introduction to the biological, clinical and psycho-social aspects of cancer, and emphasizes basic understanding of biological principles and facts about the disease process. Designed for students with little scientific background.

98. Directed Group Study (1-5) I, II, III. The Staff (Associate Dean in charge)
Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

115. Problems in Marine Biology (15) III.
Full-time study at Bodega Marine Laboratory. Prerequisite: consent of instructor based on adequate preparation for topic under consideration, i.e., appropriate laboratory courses in invertebrate zoology (normally Zoology 112), microbiology (normally Bacteriology 105 or 120), paleontology, geology, or botany; junior standing. Lecture, laboratory and field work, and directed study of a selected focal topic in marine biology, stressing experience in original research. Offered depending upon availability of instructors. Limited enrollment.

162. General Virology (4) I, Bruening (Biochemistry); Manning (Bacteriology)
Lecture—4 hours. Prerequisite: course 1; Genetics 100A and Biochemistry 101B recommended. An integrated presentation of the nature of animal, bacterial, and plant viruses, including their structure, replication and genetics.

194HA-194HB-194HC. Research Honors (3-5) I-II-III. The Staff (Associate Dean in charge)
Prerequisite: open to majors in Biological Sciences who have completed 135 units and qualify for the honors program (see this page of catalog). Opportunity for Biological Sciences majors to pursue intensive research under the guidance of a faculty adviser. Students are expected to complete the full three-quarter sequence culminating in writing of an honors thesis. (Deferred grading; P/NP grading assigned to course segments only at completion of sequence.)

197T. Tutoring in Biological Sciences (1-3) I, II, III. The Staff (Associate Dean in charge)
Prerequisite: upper division standing; appropriate background in biological sciences. Assisting in courses in Biological Sciences under the direction of the faculty. (P/NP grading only.)

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

Graduate Courses

211. Designing Instruction in the Biological Sciences (3) II. Fisher (Biological Sciences, Education)
Lecture—1 hour, laboratory—6 hours. Prerequisite: graduate standing. Students will each develop a unit of biological science instruction (such as a lecture, laboratory experiment, syllabus, text chapter, audiovisual module). Will consider goals; objectives; selection of appropriate pedagogical strategies, methods, and source materials; organization; development; and evaluation.

298. Group Study (1-5) I, II, III. The Staff (Associate Dean in charge)
Prerequisite: consent of instructor. Division of Biological Sciences staff members may offer group study courses under this number.

Professional Course

310. Effective Teaching of College Biology (2) III. Fisher (Biological Sciences, Education)
Informal lecture-discussion—2 hours. Teaching function of an academic career; objectives, nature, and methods of effective teaching; design of curricula and courses; lecturing and leading discussions; examinations and grading; evaluation; counseling; innovation. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

Biomedical Engineering (A Graduate Group)

David F. Katz, Ph.D., Chairperson of the Group (752-3304)

Group Office, 196 Briggs Hall (752-0203)

Faculty

Includes faculty members from the Departments of Animal Physiology, Human Physiology, Engineering, Physical Education, and the Schools of Veterinary and Human Medicine. Those listed below are members of the Group Executive Committee or are faculty advisers.

Fitz-Roy E. Curry, Ph.D., Associate Professor *(Human Physiology)*
Tien C. Hsia, Ph.D., Professor *(Electrical and Computer Engineering)*
Mont Hubbard, Ph.D., Associate Professor *(Mechanical Engineering)*
David F. Katz, Ph.D., Associate Professor in Residence *(Obstetrics and Gynecology)*
James F. Shackelford, Ph.D., Associate Professor *(Materials Science and Engineering)*
Worden Waring, Ph.D., Professor Emeritus *(Physical Medicine and Rehabilitation)*
Keith R. Williams, Ph.D., Assistant Professor *(Physical Education)*

Graduate Study. The Graduate Group in Biomedical Engineering offers programs of study and research leading to the M.S. and Ph.D. degrees. The programs of study are intended to prepare students for professional work in the effective integration of engineering with biology and medical sciences, including modeling of biological systems and the design of devices and procedures useful for human and veterinary medicine. It is a broad interdepartmental program which is best suited for students who are capable and comfortable with considerable independence. Each student together with an adviser defines a specific course of study suited to individual goals.

Preparation. The Group regards strong competence in mathematics and engineering as necessary for successful completion of study. Prior course work in these areas is emphasized in the evaluation of applications. Some such training can in principle be acquired after admission to the Group, but it generally necessitates one or more additional years of study.

Related Courses. Agricultural Economics 112; Biochemistry and Biophysics 215; Community Health 252; Engineering 140, 142, 144; Engineering: Chemical 161, 253A, 253B, 253C; Engineering: Civil 244; Engineering: Computer Science 8, 80, 125; Engineering: Electrical and Computer 161, 172, 176, 177, 202; Engineering: Mechanical 171, 172, 176, 222, 276; English 104; Human Physiology: 200B, 260, 261, 285; Mathematics 128A, 128B, 128C, 140, 143; Physical Education 101, 115, 201A, 220, 226; Physiological Sciences 260, 291; Physiology 112, 113, 120B, 242; Rhetoric 51; Statistics 131B, 131C, 233; Zoology 106, 202, 203, 236, 241.

Graduate Courses

200. Introduction to Biomedical Engineering (4) I, Katz
Lecture—4 hours. Introduction to application of and interaction between engineering technology and the biological and medical sciences and demonstration of some clinical applications.

210. Introduction to Biomaterials (4) II. Shackelford
Lecture—4 hours. Prerequisite: Engineering 45 or consent of instructor. Mechanical and atomic properties of metallic, ceramic, and polymeric implant materials; corrosion, degradation, and failure of implants; inflammation, wound and fracture healing, blood coagulation; properties of bones, joints, and blood vessels; biocompatibility of orthopaedic and cardiovascular materials.

252. Advanced Information Systems (3) II. Walters
Lecture—2 hours; laboratory—2 hours Prerequisite: experience in initial phases of data preparation, editing and sorting; Computer Science Engineering 125 or the equivalent; must be able to perform at graduate level. To increase through examples, projects and discussions, understanding of the components of information systems, including hardware, software, economics and people, and to prepare students to apply this understanding in the solution of specific problems in the creation, design and implementation of information systems. (Same course as Community Health 252.)

290. Seminar (1) I, II, III. Katz
Seminar—1 hour. Seminar in biomedical engineering. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
(S/U grading only.)

Biophysics (A Graduate Group)

Ronald J. Baskin, Ph.D., Chairperson of the Group

Group Office, 196 Briggs Hall (752-0203)

Faculty

Includes faculty members from the Departments of Biochemistry and Biophysics, Chemistry, Physics, Radiobiology, Zoology, and others, and the School of Medicine.

Graduate Study. The Graduate Group in Biophysics offers programs of study leading to M.S. and Ph.D. degrees. Biophysics is a broad interdepartmental program that is ideal for students who are comfortable with considerable independence. The curriculum consists of certain core courses in biology, chemistry, and physics, followed by one of the three specializations: (1) biological biophysics, (2) physical biophysics, and (3) nuclear science (that includes nuclear medical or radiation science, radiobiology, and environmental nuclear science). Specific program requirements are decided upon by a curriculum committee consisting of a research supervisor, the Graduate Adviser, and a Group member chosen at random. The Committee meets to consider individual educational needs with the student.

Graduate Adviser. N. Peek *(Physics)*, and M.G. McNamee *(Biochemistry and Biophysics)*.

Botany

(College of Letters and Science)

Michael G. Barbour, Ph.D., Chairperson of the Department

Department Office, 43 Robbins Hall (752-0617)

Faculty

Fredrick T. Addicott, Ph.D., Professor Emeritus
Lars Anderson, Ph.D., Visiting Lecturer
Floyd M. Ashton, Ph.D., Professor
Daniel I. Axelrod, Ph.D., Professor Emeritus
Michael G. Barbour, Ph.D., Professor
David E. Bayer, Ph.D., Professor
Bruce A. Bonner, Ph.D., Associate Professor
Paul A. Castelfranco, Ph.D., Professor
Alden S. Crafts, Ph.D., LL.D., Professor Emeritus
Herbert B. Currier, Ph.D., Professor Emeritus
[1]James A. Doyle, Ph.D., Professor
Emanuel Epstein, Ph.D., Professor *(Botany; Land, Air and Water Resources)*
Richard H. Falk, Ph.D., Professor
Ernest M. Gifford, Jr., Ph.D., Professor
[1]Hendrik J. Ketellapper, Ph.D., Professor
Donald W. Kyhos, Ph.D., Professor
Norma J. Lang, Ph.D., Professor
[1]William J. Lucas, Ph.D., Professor
Jack Major, Ph.D., Professor Emeritus
[1]Terence M. Murphy, Ph.D., Professor
Robert F. Norris, Ph.D., Associate Professor
Robert W. Pearcy, Ph.D., Professor
Thomas L. Rost, Ph.D., Professor
Maureen L. Stanton, Ph.D., Assistant Professor
[1]Alan J. Stemler, Ph.D., Associate Professor
C. Ralph Stocking, Ph.D., Professor Emeritus
Robert M. Thornton, Ph.D., Senior Lecturer
John M. Tucker, Ph.D., Professor
[2,3]Grady L. Webster, Ph.D., Professor
T. Elliott Weier, Ph.D., Professor Emeritus
Kenneth Wells, Ph.D., Professor

The Major Programs

Study leading to Bachelor of Arts or Bachelor of Science degrees in Botany covers several specialized areas: anatomy (internal plant structure), cytology (cellular structure and function), morphology (external plant form), physiology (plant function), taxonomy (plant classification), ecology (plant and environmental relationships), paleobotany (fossil plants), and studies of specific plant groups such as phycology (algae) and mycology (fungi). In addition, the department is a center for the study of weed science and herbicide physiology.

Botanists may teach, conduct research, or perform administrative duties. Many botanists perform public service jobs, such as in government agencies or conservation organizations. Plant scientists who have specialized in one of the applied botanical areas, such as forestry or horticulture, are usually involved in administration and/or research. Most botanists are employed by educational institutions, governmental agencies and industrial firms. The U.S. Department of Agriculture and the U.S. Forest Service employ many botanists. Some find employment with the pharmaceutical, petroleum or chemical industries, seed companies, fruit growers, and food companies.

Students who wish a less intensive program in botany than that offered by the two Bachelor of Science major options, but one that acquaints a student with plant life and its importance, should elect the Bachelor of Arts major program.

Students majoring in Botany in the *College of Letters and Science* may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Arts degree is offered only in the College of Letters and Science. The Bachelor of Science degree is offered in both the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Botany

A.B. Major Requirements

	UNITS
Preparatory Subject Matter	**34-36**
Biological Sciences 1	5
Botany 2	5
Chemistry 1A, 1B, 8A, 8B	16
Statistics 13 or 102	4
Zoology 2-2L; or Bacteriology 2 or 102, 3; or Geology 3-3L	4-6
Depth Subject Matter	**41-42**
Botany 102 or 108, 105, 111A, 111B, 114, 116 or 140, 117	29

NOTE: For key to footnote symbols, see page 123.

Genetics 120 4
Additional upper division units in Botany or related natural science courses 8-9

Total Units for the Major 75-78

Recommended
Botany 100, 118, 119; Chemistry 1C.

For students with interests in specialized areas of botany (e.g. agricultural botany, ecology, systematics and evolution, morphology, plant physiology, etc.) certain substitutions, including courses in other departments, may be allowed on prior consultation with a botany major adviser.

Botany

B.S. Major Requirements:

Option I: *For those who plan (a) advanced study in some areas of botany or a related discipline, (b) to obtain a general secondary teaching credential, or (c) training for a position requiring a detailed knowledge of plants.*

	UNITS
Preparatory Subject Matter	**54-61**
Biological Sciences 1	5
Botany 2	5
Chemistry 1A, 1B, 1C	15
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Physics 2A, 2B, 2C	9
Mathematics 16A, 16B	6
Zoology 2-2L; or Bacteriology 2 or 102, 3; or Geology 3-3L	4-6
Statistics 13 or 102	4
Depth Subject Matter	**47-49**
Biochemistry 101A, 101B	6
Genetics 120 or 100A-100B	4-6
Botany 100, 105, 108, 111A, 111B, 111L, 116, 117, 118, 119	37
Total Units for the Major	**101-110**

Recommended
Botany 199 (3-5 units); German, French or Russian. For students with interests in specialized areas of botany (e.g., agricultural botany, ecology, systematics and evolution, morphology, plant physiology, etc.), certain substitutions, including courses in other departments, may be allowed on prior consultation with a botany major adviser.

Option II: *For those who plan advanced study in physiology and/or biochemistry of plants.*

	UNITS
Preparatory Subject Matter	**56-68**
Biological Sciences 1	5
Botany 2	5
Chemistry 1A-1B-1C-5 or 4A-4B-4C	15-19
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Mathematics 16A-16B-16C or 21A-21B-21C	9-12
Physics 2A-2B-2C and 3A-3B-3C or 8A-8B-8C	12
Statistics 13 or 102	4
Depth Subject Matter	**50-53**
Biochemistry 101A, 101B, 101L, 122	14
Botany 105, 111A, 111B, 111L	14
Genetics 120	4
Chemistry 107A, 107B	6
One course each in three of the following four areas	12-15
(a) Taxonomy and evolution: Botany 102, 108	
(b) Morphology and cytology: Botany 116, 130, 140	
(c) Phycology and mycology: Botany 114, 118, 119	
(d) Ecology: Botany 117	
Total Units for the Major	**106-121**

Recommended
Botany 199 (3-5 units); German, French, or Russian; Engineering 5 or Computer Science Engineering 8.

Certain substitutions, including courses in other departments, may be allowed on prior consultation with the botany major adviser.

Breadth Subject Matter

College of Agricultural and Environmental Sciences students	**24**
English and/or rhetoric	8
Social sciences and/or humanities	16
Additional requirements as described on page 71.	

College of Letters and Science students:
Refer to page 88 for a description of requirements to be completed in addition to the major.

Major Advisers: E.M. Gifford, N.J. Lang, K. Wells (for A.B. and B.S., Option I); P.A. Castelfranco (B.S., Option II).

Minor Program Requirements:

	UNITS
Botany	**23**
To satisfy the requirements for a Botany minor, a student must complete Botany 2 (or equivalent introductory botany course)	5
Upper division units including at least one course from each of the four groups	18
(a) Structural botany: Botany 105, 114, 116, 118, 119, 130	
(b) Physiological botany: Botany 111A, 111B, Plant Science 102	
(c) Ecological botany: Botany 101, 117, 141, Zoology 149	
(d) Systematics and evolution: Botany 100,102, 108, 114, 116, 118, 119, 140	
Botany 114, 116, 118 and 119 may be offered toward satisfaction of either group (a) or (d) above. However, a single course may not satisfy both groups' requirements.	

Minor Adviser. Same as for Major above.

Honors and Honors Program. Students on the honors list may elect to substitute a maximum of 5 units of 194H for 5 upper division units of the regular major; however, recommendations for high honors and highest honors at graduation are not dependent on the completion of 194H. See pages 75 and 103 for Dean's Honors List information.

Teaching Credential Subject Representative. K. Wells See page 98 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, Lang; II, Barbour; III, Thornton
Lecture—3 hours; laboratory—6 hours. Prerequisite: introductory courses in biology and chemistry (or the equivalent) recommended. Broad survey of diversity in plant structure, function and classification. Special emphasis on flowering plants.

10. Plants, People and the Biosphere (3) III. Barbour
Lecture—3 hours. Ethnobotanical and ecological themes are emphasized in examining our dependence on plants, the ecological roles of plants, and the development of botany as a contemporary science. Non-science majors are encouraged to enroll.

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Technical and/or professional experience on or off campus. Supervised by a member of the Botany Department faculty. (P/NP grading only.)

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge.)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Evolutionary Biology of Plants (4) II. Stanton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 and Biological Sciences 1. Introduction to evolutionary principles and processes, emphasizing plants. Topics include: mutation, selections, gene flow, chromosome evolution, speciation, adaptive radiation, reconstruction of evolutionary relationships, evolutionary rates and trends, and origin and new groups.

101. Survey of Plant Communities of California (3) III. Barbour
Lecture—2 hours; weekend field trips—4 to 8 days. Prerequisite: upper division standing and consent of instructor; course 2 recommended. Structure of selected plant communities and the relationship of the component species to the environment. Recommended for non-majors.

102. California Floristics (5) III. Webster
Lecture—2 hours; lecture-discussion—1 hour; laboratory (includes 3 one-day weekend field trips)—6 hours. Prerequisite: course 2 or an equivalent in plant science. Survey of the flora of California, with emphasis on field recognition and identification of important vascular plant families and genera characterizing the major floristic regions. Lectures review the taxonomic diversity, evolutionary relationships, and geographical patterns of California flora.

105. Plant Anatomy (5) I, Rost
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Survey of structure and function of vascular plant cells, tissues and organs with an emphasis on development. Current literature in plant development is discussed.

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.

***109. Computer-Assisted Methods in Systematics and Ecology** (4) I.
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: one course in systematic biology or one course in ecology. Examination of the theoretical background and applications of computer assisted methods in systematics and ecology including measures of similarity and difference, cluster analysis, ordination techniques, and evolutionary estimating procedures. A project using these methods. Offered in odd-numbered years.

111A. Introduction to Plant Physiology (3) II. Thornton
Lecture—3 hours. Prerequisite: course 2; Chemistry 8B (may be taken concurrently). Fundamental activities of plants; the plant cell as a functioning unit. The processes of absorption, movement and utilization of water and minerals. Water loss, translocation, photosynthesis.

111B. Introduction to Plant Physiology (3) III, Thornton; III, Ketellapper
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) III. Bonner
Discussion—1 hour; laboratory—6 hours. Prerequisite: course 111B (may be taken concurrently). An introduction into basic experimental techniques and instrumentation used in the investigation of plant physiological processes such as water)solute absorption and their movement and utilization; translocation; transpiration; photosynthesis; respiration; growth; development and reproduction.

112A. Problems in Plant Physiology (1) II. Thornton
Discussion—1 hour. Prerequisite: course 111A (concurrently). Discussion of problems and applications relating to principles presented in course 111A. Students will be assigned problems each week that show novel applications of the principles described in the lecture course and will prepare answers to be delivered orally during the class period. (P(NP grading only.)

112B. Problems in Plant Physiology (1) III. Castelfranco
Discussion—1 hour. Pre requisite: course 111B (concurrently). Discussion of problems and applications relating to principles presented in course 111B. Students will be assigned problems each week that show novel applications of the principles described in the lecture course and will prepare answers to be delivered orally during the class period. (P(NP grading only.)

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.

115. Marine Botany (10) Extra-session summer. Krupp
Lecture—10 hours; laboratory—20 hours. Prerequisite: general botany (course 2) or the equivalent. Full time study at the Bodega Marine Laboratory. Includes lectures, laboratories, and field work with emphasis on the morphology, identification, and natural history of the marine algae.

116. Morphology and Evolution of Vascular Plants (4) II. Gifford
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2. Introduction to form, structure and evolutionary history of selected plants from major phyla; emphasis given to living ferns and seed-producing plants and their possible relationships to plants of past eras; structure-function relationships and adaptations to changing environments.

117. Plant Ecology (4) I, Stanton
Lecture—3 hours; several Friday or Saturday field trips. Prerequisite: plant physiology (course 111B) and plant

NOTE: For key to footnote symbols, see page 123.

identification (course 102 or 108) strongly recommended. The study of interactions between plant populations or vegetation types and their environment. Special emphasis on California. Students taking course 117 may not receive credit for course 101.

118. Phycology (5) II. Lang
Lecture—3 hours; laboratory—6 hours; one field trip. Prerequisite: course 2. Comparative morphology, physiology and development of major phyla (including blue-green algae) with emphasis on phylogeny in Chlorophyta; laboratory exercises stress identification and culturing. Environmental significance and exploitation of freshwater and marine forms considered.

119. Introductory Mycology (5) I. Wells
Lecture—3 hours; laboratory—6 hours; weekend field trip. Prerequisite: course 2 or Bacteriology 2 and 3; introductory genetics course recommended. 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 of dispersal, seed germination and dormancy, growth and development, ecology, interaction of weeds and crops, natural succession, and herbicide induced succession. Laboratories will emphasize taxonomy of weeds and demonstrate principles discussed in lectures.

122. Action of Herbicides (3) III. Ashton
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 120; Soil Science 100; courses 111A, 111B recommended. Influence of plants and soils on the action of herbicides. Absorption, translocation, fate, mechanism of action and symptoms of herbicides in plants. Effects of herbicides on plant populations. Physical and molecular fate of herbicides in soils.

130. Survey of Cell Biology (4) I, Falk, Wolfe (Zoology)
Lecture—4 hours. Prerequisite: Chemistry 8B or 128C; introductory course in biochemistry strongly recommended. Survey of cell biology, including the major cell organelles and structures and their function in energy metabolism, motility, synthesis, and cell division. Structure and function of the cell surface and cell origins also considered. Not open to students who have received credit for Zoology 121A-121B. (Same course as Zoology 130.)

***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.

135. Mineral Nutrition of Plants (4) III. Epstein
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 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. (Same course as Plant Science 135.)

140. Introductory Paleobotany (4) II.
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2. Introduction to plant fossil record, beginning with invasion of land in the Silurian, emphasizing origin and evolution of major groups and adaptations and changing composition and distribution of floras in relation to plate tectonics and climatic change.

***141. Plant Geography** (4) II.
Lecture—3 hours; laboratory-discussion—3 hours. Prerequisite: course 102, 108, or 116, or consent of instructor; course 117 recommended. Analysis of the distribution patterns of the vascular plant groups, and consideration of the factors which account for the present diversity of the flora and vegetation.

***142. Cenophytic Paleobotany and Angiosperm Evolution** (4) III. Doyle
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 108 or 116 or 140. Critical analysis of the plant fossil record as a source of evidence on origin, evolution, and phylogeny of the angiosperms, Cretaceous and Tertiary climates, geographic history of modern taxa, and origin of modern vegetation types.

***143. Palynology** (4) III.
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 108 or 116 or 140. Morphology of spores and pollen grains and their use in stratigraphy, plant systematics and evolution, and paleoecology. Techniques for study of modern spores and pollen and extraction and identification of fossil palynomorphs from sediments of Paleozoic to Quaternary age.

150. Fresh Water Angiosperms (3) I, Anderson
Lecture—2 hours; laboratory—3 hours. Common fresh water macrophytes, their reproductive modes, physiology, growth (photosynthesis, nutrient utilization), development (hormonal interactions), ecology and management. Laboratories include one or more field trips, experimental manipulation of growth and development. Offered in odd-numbered years.

155. Anatomical and Cytological Methods (4) I, Gifford
Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: course 2 or the equivalent introductory course in biology; consent of instructor. Practical laboratory methods in preparing biological materials for examination with the light microscope; special emphasis given to localization of cell constituents; introduction to photomicrography and autoradiography.

190C. Research Conference in Botany (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper division standing in botany or related discipline; consent of instructor. Introduction to research methods in botany. Design of field or laboratory research projects, survey of appropriate literature, and discussion of research by faculty and students. May be repeated for credit. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: upper division standing; consent of instructor. Technical and/or professional experience on or off campus. Supervised by a member of the Botany Department faculty. (P/NP grading only.)

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: open only to majors of senior standing on honors list. Independent study of selected topics under the direction of a member or members of the staff. Completion will involve the writing of a senior thesis. (P/NP grading only.)

197T. Tutoring in Botany (1-5) I, II, III. The Staff
Prerequisite: upper division standing and consent of instructor. Designed for undergraduate students who desire teaching experience. Student contact will be primarily in laboratory or discussion sections. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge.)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

***202. Plant Ecophysiology** (3) II. Pearcy
Lecture—3 hours. Prerequisite: courses 111A, 111B, 117, and consent of instructor. Study of the mechanisms of physiological adaptation of plants to their environment.

203. Ecophysiological Methods (3) III. Pearcy
Lecture—1 hour; laboratory—4 hours; individual project; one Saturday field trip to be arranged. Prerequisite: courses 111A, 117, and consent of instructor. A laboratory and lecture course covering basic concepts underlying the research methods and instrumentation useful in plant ecophysiology.

205A. Advanced Plant Physiology (3) III.
Lecture—3 hours. Prerequisite: course 111B; Chemistry 107A or consent of intructor. Cellular physiology, plant water relations, translocation and membrane transport.

205B. Advanced Plant Physiology (3) II. Castelfranco
Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101B. Photosynthesis, respiration, and general plant metabolism.

205C. Advanced Plant Physiology (3) I, Bonner
Lecture—3 hours. Prerequisite: course 111B, Biochemistry 101A; courses 205A and 205B, Biochemistry 101B recommended. Internal and environmental regulation of plant growth and development.

206A. Advanced Plant Physiology Laboratory (3) III.
Laboratory—6 hours; term paper. Prerequisite: course 205A (may be taken concurrently). Laboratory procedures in plant physiology. Experiments demonstrate the theory and practice of modern instrumentation, and are designed to illustrate subject matter of course 205A.

206B. Advanced Plant Physiology Laboratory (3) II.
Laboratory—9 hours. Prerequisite: course 205B (may be taken concurrently); Biochemistry 101L. Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205B.

206C. Advanced Plant Physiology Laboratory (3) I, Bonner
Laboratory—9 hours. Prerequisite: course 205C (may be taken concurrently). Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205C.

***212. Physiology of Herbicidal Action** (3) II.
Lecture—3 hours. Prerequisite: courses 111B, 122. Study of the fundamental processes involved in the physiological action of herbicides. Detailed consideration of the fate of herbicides in plants.

***215. Light and Plant Growth** (3) II.
Lecture—3 hours. Prerequisite: courses 205A, 205B, 205C; Physics 2C. Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis.

***217. Concept and Measurement of the Plant Community** (3) I.
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, Kosuge (Plant Pathology); III, Bayer
Seminar—2 hours. Analysis in depth of recent advances in plant physiology. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures. May be repeated for credit. (S/U grading only.)

***222. Special Topics in Plant Morphology, Systematics, and Ecology** (2) II.
Seminar—2 hours. Analysis in depth of recent advances in plant structure and evolution. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures. May be repeated for credit. (S/U grading only.)

***225. Molecular Aspects of Plant Development** (3) II.
Lecture—2 hours; discussion—1 hour. Prerequisite: course 111A-111B and Biochemistry 101B; Biochemistry 153 or Genetics 102 strongly recommended. Consideration of gene expression during growth and differentiation of plant tissues. Emphasis on techniques and recent literature. Offered in even-numbered years.

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.
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.
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 108; Genetics 103 recommended. Principles of plant taxonomy; phylogenetic vs. phenetic classification; examples of the way in which various disciplines—anatomy, embryology, biochemistry, etc.—elucidate problems of taxonomic relationship, mainly of genera and higher categories.

***256A. Experimental Plant Taxonomy** (2) II.
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 108; course 117 and Genetics 103 recommended. Application of experimental techniques to the elucidation of taxonomic problems and evolutionary relationships in higher plants.

***256B. Experimental Plant Taxonomy** (2) III. Kyhos
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 256A. A continuation of course 256A. Study of variation in natural 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.

290. Seminar (1) I, Tucker; II, Rost; III, Kyhos
Seminar—1 hour. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

290C. Research Conference in Botany (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and discussion by faculty and graduate students of research projects in botany. May be repeated for credit. (S/U grading only.)

291. Seminars in Botany (1) I, Barbour; II, Ashton, Pearcy; III, Stanton
Seminar—1 hour. Review of current literature in botanical disciplines. Disciplines and special subjects to be announced quarterly. Students present and analyze assigned topics. May be repeated for credit. (S/U grading only.)

295. Seminar in Mycology (1) I, Butler (Plant Pathology); III, Wells
Seminar—1 hour. Review and evaluation of current literature and research in mycology. (S/U grading only.) (Same course as Plant Pathology 295.)

297T. Tutoring in Botany (1-5) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor. Designed for graduate students who desire teaching experience, but are not teaching assistants. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Professional Course

390. The Teaching of Botany (2) I, II, III. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: graduate standing; concurrent appointment as a teaching assistant in Botany. Consideration of the problems of teaching botany, especially of preparing for and conducting discussions, guiding student laboratory work, and the formulation of questions and topics for examinations. (S/U grading only.)

Botany (A Graduate Group)

Hendrik J. Ketellapper, Ph.D., Chairperson of the Group

Group Office, 152 Robbins Hall (752-7094)

Faculty. Includes faculty members of the Department of Botany and scientists from various other departments in the field of plant science.

Graduate Study. The Graduate Group in Botany serves to direct and correlate graduate studies for the M.S. and Ph.D. degree programs in botanical sciences. Specific program specializations include anatomy, cytology, genetics, biochemistry, ecology, morphology, weed science, mycology, paleobotany, phycology, physiology, and taxonomy. Studies in these specialized fields are designed to prepare students for careers in teaching and research in botany at the college or university level or in research in basic or applied botany in university, government, or industrial laboratories.

Preparation. Applicants are expected to hold a bachelor's degree in botany, biology, or a closely related discipline. Courses in the following areas are considered to be prerequisite to advanced degrees: plant morphology (including courses treating algae and/or fungi), anatomy, systematics, ecology, physiology, genetics, organic chemistry, biochemistry, general physics, calculus, and statistics. The Graduate Adviser and major professor will designate advanced courses to meet individual academic needs.

Cantonese

See Asian American Studies

Cell and Developmental Biology (A Graduate Group)

Barry F. King, Ph.D., Chairperson of the Group (752-7100)

Group Office, 2320 Storer Hall (752-7465)

Faculty. The Group includes faculty members from ten departments in the College of Agriculture and Environmental Sciences, College of Letters and Science, and the School of Medicine.

Graduate Study. The Graduate Group in Cell and Developmental Biology offers programs of study leading to the Ph.D. degree. Cell and Developmental Biology is a broad interdepartmental program. The curriculum consists of certain core courses in cell biology or developmental biology. Specific programs of study are decided upon by an advisory committee chaired by the student's research adviser, and the choice of major core courses will reflect the student's primary research interest.

Preparation Appropriate preparation is an undergraduate degree in a biological or physical science. Prepartion should include a year of calculus, physics, general chemistry and organic chemistry, and introductory courses in statistics, biochemistry, genetics and biology.

Graduate Advisers. P.M. Cala (Human Physiology), R.L. Nuccitelli (Zoology).

Chemistry

(College of Letters and Science)

Peter A. Rock, Ph.D., Chairperson of the Department

Richard E. Kepner, Ph.D., Vice-Chairperson of the Department

Department Office, 108 Chemistry Building (752-0503/0953)

Faculty

Thomas L. Allen, Ph.D., Professor
Lawrence J. Andrews, Ph.D., Professor
Alan L. Balch, Ph.D., Professor
Albert T. Bottini, Ph.D., Professor
Robert K. Brinton, Ph.D., Professor Emeritus
David A. Case, Ph.D., Associate Professor
Joyce T. Doi, Ph.D., Adjunct Lecturer
Timothy C. Donnelly, Ph.D., Visiting Lecturer
W. Ronald Fawcett, Ph.D., Professor
William H. Fink, Ph.D., Professor
Edwin C. Friedrich, Ph.D., Professor
Sevgi S. Friedrich, Ph.D., Visiting Lecturer
Hakon Hope, Cand. real., Professor
Raymond M. Keefer, Ph.D., Professor Emeritus
Joel E. Keizer, Ph.D., Professor
Richard E. Kepner, Ph.D., Professor
[3]Mark J. Kurth, Ph.D., Assistant Professor
[4]Gerd N. LaMar, Ph.D., Professor
[4]August H. Maki, Ph.D., Professor
Donald A. McQuarrie, Ph.D., Professor
Claude F. Meares, Ph.D., Professor
R. Bryan Miller, Ph.D., Professor
W. Kenneth Musker, Ph.D., Professor
Charles P. Nash, Ph.D., Professor
Edgar P. Painter, Ph.D., Professor Emeritus
[2]Philip P. Power, Ph.D., Assistant Professor
Peter A. Rock, Ph.D., Professor
[3,4]John W. Root, Ph.D., Professor
Robert N. Rosenfeld, Ph.D., Assistant Professor
Carl W. Schmid, Ph.D., Professor
Neil E. Schore, Ph.D., Associate Professor
Kevin M. Smith, Ph.D., Professor
[4]Leo H. Sommer, Ph.D., Professor
James H. Swinehart, Ph.D., Professor
Dino S. Tinti, Ph.D., Professor
Nancy S. True, Ph.D., Assistant Professor
David H. Volman, Ph.D., Professor
George S. Zweifel, Sc.D., Professor

The Major Programs

The goal of a bachelor's program in chemistry is to give a broad introduction to the principles of the field and to provide enough of the factual knowledge so that the student may quickly learn the specific chemistry applicable to the field in which the student chooses to work. Two programs in chemistry are available, one leading to the Bachelor of Arts and the other to the Bachelor of Science. Students who are interested in chemistry as a profession would normally elect the program leading to the B.S. degree, which is accredited by the American Chemical Society. The curriculum leading to an A.B. degree offers a less intensive program in chemistry and is appropriate for a student with a strong interest in chemistry, but who also has another goal such as professional school preparation or secondary school teaching. Students who plan to pursue graduate work in chemistry or related fields are strongly advised to obtain a reading knowledge of German or Russian. High school students should note that the preparation for either the A.B. or the B.S. degree is simplified if their high school programs include chemistry and four years of mathematics. Degree candidates in chemistry will receive upper division credit for those lower division chemistry courses accepted in lieu of upper division courses required for the major.

Career Alternatives. Chemistry graduates with bachelor's degrees are employed extensively throughout industry in production supervision, quality control, technical marketing, and other areas of applied chemistry. Some of the firms employing these graduates are in the food and beverage processing industries, the petroleum industry, paper and textile production and processing, the chemical industry, pharmaceuticals, and the photographic industry. An advanced degree is usually required for a career in research or education.

Chemistry

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**36-43**
Chemistry 1A-1B-1C-5 or 4A-4B-4C	15-19
Physics 2A-2B-2C and 3A-3B-3C	12
Mathematics 21A-21B-21C or 16A-16B-16C	9-12
Depth Subject Matter	**36**
Chemistry 110A, 110B, 110C, 128A, 128B, 128C, 129A, 129B	22
At least 14 additional upper division units in chemistry, biochemistry, or physics	14
Total Units for the Major	**72-79**

Chemistry

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**49-53**
Chemistry 1A-1B-1C-5 or 4A-4B-4C	15-19
Physics 8A, 8B, 8C, 8D.	16
Mathematics 21A, 21B, 21C, 22B; 22A or 22C	18
Depth Subject Matter	**45**
Chemistry 110A, 110B, 110C, 111A, 111B, 124, 128A, 128B, 128C, 129A, 129B, 129C	36
At least 9 additional upper division units in chemistry (except Chemistry 107A, 107B), including one course with laboratory work	9
Total Units for the Major	**98-102**

Major Advisers. T.L. Allen, W.H. Fink, R.E. Kepner, R.B. Miller, C.W. Schmid, N.E. Schore, D.S. Tinti.

NOTE: For key to footnote symbols, see page 123.

Honors and Honors Program. The honors program comprises 6 units of course 194H.

Teaching Credential Subject Representative. C. P. Nash. See page 98 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, S. Friedrich, McQuarrie, Rock; II, Allen, 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, Donnelly, McQuarrie, True; III, Allen, Donnelly
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 1A or 4A. Continuation of course 1A. Chemical equilibria, oxidation-reduction processes, electrochemistry, introduction to qualitative analysis.

1C. General Chemistry (5) I, Fink, ———; III, McQuarrie, ———, Power
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 1B or 4B. Continuation of course 1B. Chemical kinetics, structures and reactions of complexions and molecules, application of principles of chemistry to problems of qualitative analysis. Students who have had course 4B may receive only 4 units of credit for course 1C.

4A. General Chemistry (5) I, Tinti
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Mathematics 21A or 16A (may be taken concurrently); high school chemistry or consent of instructor. An introduction to atomic and molecular structure and binding, states of matter, thermochemistry and chemical equilibria. Courses 4A-4B-4C are equivalent to course sequence 1A-1B-1C-5. The sequence 4A-4B-4C is primarily for students majoring in the physical sciences.

4B. General Chemistry (5) II. Nash
Lecture—3 hours, laboratory—6 hours. Prerequisite: course 4A. Continuation of course 4A. A quantitative treatment of chemical equilibria with applications to precipitation reactions, acid-base reactions, complexation reactions, and oxidation-reduction reactions. Elementary electrochemistry and chemical kinetics. The laboratory will emphasize quantitative techniques.

4C. General Chemistry (5) III. Swinehart
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 4B. Continuation of course 4B. Topics in systematic inorganic chemistry, nuclear chemistry, introduction to organic chemistry and the functional group concept, biological applications. Laboratory will emphasize qualitative analysis and preparative techniques.

5. Quantitative Analysis (4) I, Donnelly; III. Nash
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1C with a grade of C or higher. An introduction to the principles and methods of quantitative chemical analysis with emphasis on the application of equilibrium theory to analytical problems. Students who have received credit for the 4A-4B-1C sequence may enroll in course 5 for 2 units only; not open to students who have received credit for 4A-4B-4C.

8A. Organic Chemistry: Brief Course (3) I, Sommer; II, E. Friedrich, Musker; III, Smith
Lecture—3 hours. Prerequisite: course 1B with a grade of C or higher. With course 8B an introduction to the nomenclature, structure, chemistry, and reaction mechanisms of organic compounds. Intended for students majoring in areas other than chemistry.

8B. Organic Chemistry: Brief Course (3) I, Doi; II, Sommer; III, Bottini
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 8A. Continuation of course 8A. The laboratory is concerned primarily with the study of the properties and chemistry of the common classes of organic compounds.

10. Concepts of Chemistry (4) I, Case
Lecture—4 hours. A survey of basic concepts and contemporary applications of chemistry. Designed for non-science majors and not as preparation for Chemistry 1A. Course not open to students who have had Chemistry 1A; but students with credit for course 10 may take Chemistry 1A for full credit.

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

Upper Division Courses

107A. Physical Chemistry for the Life Sciences (3) I, Meares, Schmid
Lecture—3 hours. Prerequisite: course 4C or 5 or consent of instructor. Mathematics 16C or 21C; one year college level physics. A basic course in physical chemistry intended for majors in the life science areas. Introductory development of classical and statistical thermodynamics including equilibrium processes and solutions of nonelectrolytes. Kinetic theory of gases and liquids. Transport processes in liquids and solutions.

107B. Physical Chemistry for the Life Sciences (3) II. 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 collodial systems. Considerations on bioirreversible processes.

108. Physical Chemistry of Macromolecules (3) III. Meares
Lecture—3 hours. Prerequisite: course 107B or 110C. Physical properties and characterization of macromolecules with emphasis upon those of biological interest. Structural thermodynamic, optical and transport properties of polymers in bulk and in solution. Physical characterization methods. Special topics on the properties of polyelectrolyte systems.

110A. Physical Chemistry: Thermodynamics (3) I, Hope, Volman; III, Rock
Lecture—3 hours. Prerequisite: course 5 or 4C; Mathematics 21C or 16C; one year of college physics. Development and application of the principles of chemical thermodynamics.

110B. Physical Chemistry: Quantum Mechanics (3) I, Allen; II, Maki
Lecture—3 hours. Prerequisite: course 110A. Atomic and molecular structure and spectra.

110C. Physical Chemistry: Kinetics (3) II, III. Volman
Lecture—3 hours. Prerequisite: course 110B. Statistical thermodynamics, kinetic theory of gases, and chemical kinetics.

111A. Physical Chemistry: Methods and Applicstions (4) I, Hope; II, Tinti
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, ———; III, Tinti
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.

115. Instrumental Analysis (4) II. Fawcett
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 110A or consent of instructor. Theory and practice of modern instrumental techniques of chemical analysis with emphasis on spectroscopic and electroanalytical methods and separation science. Introduction to instrumentation electronics with empahasis on operational amplifiers. Laboratory focuses on trace analyses of samples having practical significance.

121. Introduction to Molecular Structure and Spectra (4) III. True
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.

126. Nuclear and Radiochemistry (3) I, Root
Lecture—3 hours. Prerequisite: course 110B (may be taken concurrently with consent of instructor). Introduction to theory and experimental methods in nuclear and radiochem istry including nuclear properties, radioactive decay, isotope effects, nuclear thermodynamics, radiation effects, and short-lived radiotracer applications in mechanistic, and physical chemistry.

128A. Organic Chemistry (3) I, Schore; II, Rosenfeld; III, Musker
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, Zweifel; II, Smith; III, E. Friedrich
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 chem istry of carbonyl compounds. Introduction to the application of spectroscopic methods to organic chemistry.

128C. Organic Chemistry (3) I, E. Friedrich; II, Kepner; III, Schore
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, Kurth; II, Miller; III, S. Friedrich
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1C or 4C with a grade of C or higher; 128A (may be taken concurrently). Introduction to laboratory techniques of organic chemistry. Emphasis is on methods used for separation and purification of organic compounds. Only one unit credit allowed students having had course 8B.

129B. Organic Chemistry Laboratory (2) I, Kepner; II, Schore; III, Zweifel
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, Bottini; II, Kepner; III, Doi
Laboratory—6 hours. Prerequisite: courses 128C (may be taken concurrently) and 129B. Continuation of course 129B.

130. Qualitative Organic Chemistry (4) III. Miller
Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 5, 128C, 129C. The application of physical and chemical techniques to the qualitative identification of organic compounds.

131. Modern Methods of Organic Synthesis (4) II. Zweifel
Lecture—4 hours. Prerequisite: course 128C, or consent of instructor. Introduction to modern synthetic methodology in organic chemistry with emphasis on stereoselective reactions and application to multistep syntheses of organic molecules containing multifunctionality.

140. Synthetic Methods (4) III. Balch
Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 124, 128C, 129C. An integrated inorganic-organic course in the preparation, purification and characterization of multifunctional organic, organometallic, and transition metal compounds using a wide range of methods.

150. Chemistry of Natural Products (3) I, Smith
Lecture—3 hours. Prerequisite; course 128C. Chemistry of terpenes, steroids, acetogenins, and alkaloids; isolation, structure determination, biosynthesis, chemical transformations, and total synthesis.

194H. Undergraduate Research (2-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: course 110C (may be taken concurrently) and honors status. Original research and a written report of the investigation. Unit value to be determined by instructor supervising the research. (P/NP grading only.)

197. Projects in Chemical Education (1-4) I, II, III. The Staff (Chairperson in charge)
Discussion and/or laboratory. Prerequisite: consent of instructor. Participation may include development of laboratory experiments, lecture demonstrations, autotutorial modules or assistance with laboratory sessions. May be repeated for credit for a total of 12 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics and physics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics, and physics. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

Graduate Courses

210A. Advanced Physical Chemistry: Thermodynamics (4) I, Keizer
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. Fink
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. Case
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. Kurth
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) I, II, III. The Staff
Lecture—3 hours. Selected topics of current interest in organic chemistry. Topics will vary each time the course is offered, and in general will emphasize the research interests of the staff member giving the course.

226. Principles of Transition Metal Chemistry (3) I, Balch
Lecture—3 hours. Prerequisite: course 124 or the equivalent. Electronic structures, bonding, and reactivity of transition metal compounds.

227A-F. Special Topics in Inorganic Chemistry (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Series of advanced, research-oriented special topics courses in inorganic chemistry.

230A-J. Special Topics in Physical Chemistry (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Series of advanced, research-oriented, special-topics courses in physical chemistry. Topics will vary each time the course is offered.

233. Physical Organic Chemistry (4) I, Rosenfeld
Lecture—4 hours. Modern concepts of substitution, elimination, and addition reactions, rearrangements, and stereochemistry.

290. Seminar (1) I, II, III. Fawcett, Miller, Swinehart, True
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

293. Introduction to Chemistry Research (1) I. The Staff (Graduate Advisers in charge)
Discussion—2 hours. Designed for incoming graduate students preparing for higher degrees in chemistry. Group and individual discussion of research activities in the Department and research topic selection. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
The laboratory is open to qualified graduate students who wish to pursue original investigation. Students wishing to enroll should communicate with the department well in advance of the quarter in which the work is to be undertaken. (S/U grading only.)

Professional Course

390. Methods of Teaching Chemistry (3) I, II, III. The Staff (Chairperson in charge)
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: graduate student standing in Chemistry; consent of instructor. Practical experience in methods and problems of teaching chemistry. Includes analyses of texts and supporting material, discussion of teaching techniques, preparing for and conducting of discussion sessions and observing and guiding student laboratory work. Participation in the teaching program required for Ph.D. in Chemistry. May be repeated for credit. (S/U grading only.)

Chicano Studies

See Mexican-American (Chicano) Studies

Child Development (A Graduate Group)

Keith Barton, Ph.D., Chairperson of the Group

Group Office, 106 Academic Office Building-4 (752-2244/7770)

Faculty. Includes faculty members from the departments of Applied Behavioral Sciences, Anthropology, Behavioral Biology, Education, Psychology, and the Schools of Law and Medicine.

Graduate Study. The Graduate Group in Child Development offers a multidisciplinary program which leads to the M.S. degree under degree Plan I, the thesis. The aim of the program is to provide students an opportunity to pursue a coordinated course of postgraduate study in the field of child development which cuts across departmental boundaries. Opportunities are provided to work with children and adults in the community including the University's Early Childhood Laboratory (ECL). Recipients of the degree gain sufficient background in the biological and social sciences to engage in professions dealing with children, obtain positions in teaching or research settings, or pursue further study leading to a doctorate in child development or related fields.

Graduate Adviser. L.V. Harper *(Applied Behavioral Sciences).*

Chinese

See Asian American Studies, and Oriental Languages and Civilizations

Classics

(College of Letters and Science)

Department Office (Spanish and Classics), 616 Sproul Hall (752-0835)

Faculty

Richard E. Grimm, Ph.D., Associate Professor
Lynn E. Roller, Ph.D., Assistant Professor
Wesley E. Thompson, Ph.D., Professor
David A. Traill, Ph.D., Associate Professor

The Major Programs

Classics offers three major programs: *Latin, Greek,* and *Classical Civilization.* The major programs in Greek and Latin consist of the detailed study of the great works of Greek or Latin literature in the original language, including epic, lyric, drama, philosophy, history, and oratory. Both majors emphasize the study of language and literature. The major program in Classical Civilization offers an interdisciplinary approach to the ancient world. Students choosing this major supplement a core of courses in Greek or Latin (or both) with courses in ancient art, archaeology, history, philosophy, etc. All three majors provide the opportunity to study in depth a civilization that has profoundly influenced the western world.

The programs in Latin and Greek and, with careful planning, the program in Classical Civilization offer excellent preparation for graduate study in Classics, ancient history, comparative literature, and archaeology. In addition, the major in Greek provides suitable background for divinity school or for graduate work in philosophy.

The majors in Latin and Classical Civilization may lead to careers in teaching (Latin, history, general humanities) or museum work (Classical Civilization). All three majors can lead to careers in librarianship, journalism, and civil service. The professional schools, particularly law schools, have traditionally looked with favor on highly qualified students with training in Latin or Greek.

Classical Civilization

A. B. Major Requirements:

	UNITS
Preparatory Subject Matter	**21-24**
Greek 1, 2, 3 or Latin 1, 2, 3 or the equivalent	12-15
Three courses from the following, including at least one from Group (a)	9
(a) Classics 17A, 17B, 17C, 20.	
(b) Classics 4A, 10, 40, 41.	
Depth Subject Matter	**40**
Three upper division courses in Latin or Greek	12
At least 28 units from the following, with or without emphasis in a single area, chosen in consultation with a major adviser	28
(a) *Language and Literature:* All upper division courses in Latin and Greek; Classics 139B, 141, 142	
(b) *History:* History 111A, 111B, 111C, 102A Religious Studies 102	
(c) *Art, Archaeology, and Drama:* Classics 174, 175, Art 154A, 154B, 155, Dramatic Art 156	
(d) *Philosophy and Political Theory:* Classics 150, Philosophy 143, 161, 162, Political Science 118A, Rhetoric 110	
Total Units for the Major	**61-64**

Recommended
Art 1A; History 2; Philosophy 21; Comparative Literature 1; Religious Studies 40.

Greek

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**0-15**
Greek 1, 2, 3 (or the equivalent)	15
Depth Subject Matter	**36**
Upper division units in Greek (two courses may be chosen from department-approved courses in related fields).	
Total Units for the Major	**36-51**

Recommended
Latin 1, 2, 3.

Latin

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**0-12**
Latin 1, 2, 3 (or the equivalent)	12
Depth Subject Matter	**36**
Latin 121	5
At least 31 additional upper division units in Latin	31
Total Units for the Major	**36-48**

Major Advisers. D. A. Traill (Classical Civilization); W. E. Thompson (Greek); and R. E. Grimm (Latin).

NOTE: For key to footnote symbols, see page 123.

Minor Program Requirements:

	UNITS
Greek	**21**
Greek 3	5
Four upper division courses in Greek	16

	UNITS
Latin	**20**
Latin 3	4
Four upper division courses in Latin	16

Teaching Credential Subject Representative. R. E. Grimm. See page 98 for the Teacher Education Program.

Graduate Study. A program of study and research leading to the M.A. degree in Classics is offered. Detailed information regarding graduate study may be obtained from the Graduate Adviser.

Graduate Adviser. W. E. Thompson.

Courses in Classics

Lower Division Courses

4A. Classical Civilization (3) III. Roller
Lecture—3 hours. An introduction to the literature, art, and institutions of classical Greece.

10. Greek and Roman Mythology (3) I, Thompson
Lecture—3 hours. Origin and development of myths and legends, their place in the religion, literature, and art of Greece and Rome.

17A. Greek Archaeology (3) I, Roller
Lecture—3 hours. Greece, Crete, and the Aegean world during the Bronze Age with emphasis on the Minoan and Mycenaean civilizations. Consideration of certain aspects of Homeric civilization in light of the archaeological remains.

17B. Greek Archaeology (3) II. Roller
Lecture—3 hours. The archaeological monuments of Archaic and Classical Greece. Selections from Greek literature are related to the archaeological remains.

***17C. Roman Archaeology** (3) III. Roller
Lecture—3 hours. The development of Rome and its Empire as illustrated by the monuments.

20. Pompeii AD 79 (3) III. Traill
Lecture—3 hours. Roman life in an urban community at the time of the eruption of Vesuvius. Slide presentations of the archaeological evidence will be supplemented by selected readings from Petronius' *Satyricon* and other ancient authors.

30. Greek and Latin Elements in English Vocabulary (3) II. The Staff
Lecture—3 hours. Knowledge of Latin and Greek not required. Elements of Greek and Latin vocabulary for increased understanding of English word formation and improved ability to understand and retain unfamiliar words. Empahsis on Greek and Latin elements but other languages not neglected.

31. Greek and Latin Elements in Technical Vocabulary (3) III. Baldwin
Lecture—3 hours. Knowledge of Greek and Latin not required. Elements of Greek and Latin vocabulary to increase understanding of English word formation in medical, scientific and technical terminology and improve ability to understand and retain unfamiliar terms.

40. Homer and the Tradition of Ancient Epic (3) II. Traill
Lecture—3 hours. Reading in translation of the *Iliad* and *Odyssey*. Homer's influence on Vergil. Lectures on the development of ancient epic. Offered in odd-numbered years.

41. Greek Tragedy (3) III. Grimm
Lecture—3 hours. Reading in translation of selected plays of Aeschylus, Sophocles, and Euripides. Lectures on the development and influence of Athenian tragedy.

Upper Division Courses

***139B. Greek Literature in Translation** (3) II. Thompson
Lecture—3 hours. Development of historical writing in Greece: Herodotus, Thucydides, and selections from the minor historians. Offered in even-numbered years.

***141. Greek and Roman Comedy** (4) II. Grimm
Lecture—3 hours; conference—1 hour. Readings in Aristophanes, Menander, Plautus, and Terence; lectures on the development of ancient comedy. Offered in odd-numbered years.

***142. Greek and Roman Novel** (4) I, Traill
Lecture—3 hours. Examination of the ancient Greek romances and their development into the grotesque realism of Petronius' *Satyricon*, and the religious mysticism of Apuleius' *The Golden Ass*.

***150. Athenian Political and Social Institutions** (3) II. Thompson
Lecture—2 hours; discussion—1 hour. Politics and government, marriage and kinship, religious societies, and the demographic and economic basis of Athenian democracy. Offered in odd-numbered years.

***174. Ancient Greek Sanctuaries** (4) III. Roller
Lecture-discussion—4 hours. Prerequisite: course 17B or consent of instructor. The history, cults, and monuments of Olympia, Delphi, and other sanctuaries. Student reports on major monuments. Offered in even-numbered years.

***175. Topography and Monuments of Ancient Athens** (4) III. Roller
Lecture-discussion—4 hours. Prerequisite: course 17A-17B or consent of instructor. The history of Athens as an urban center from the Bronze Age through the late Roman period. Student reports on major monuments with emphasis placed on restoration, chronology, and on the relating of documentary to excavational evidence. Offered in odd-numbered years.

197TC. Community Tutoring in Classical Languages (1-5) I, II, III. Grimm
Prerequisite: consent of instructor. Supervised instruction of Greek or Latin in nearby schools by qualified students in department. May be repeated for credit up to 5 units. (P/NP grading only.)

Graduate Courses

201. Introduction to Classical Philology (4) I, Thompson
Seminar—3 hours. Survey of major contemporary areas of classical scholarship with special attention devoted to current problems in literary and textual criticism.

202. Homer (4) III. The Staff
Seminar—3 hours. Readings in the *Illiad* and *Odyssey:* the origins and transmission of the poems.

***203. Vergil** (4) II. Grimm
Seminar—3 hours. Reading of selected books of the *Bucholics, Georgics*, and *Aeneid*. Emphasis will be placed on the study of Vergilean 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 philogical analysis of the plays of Euripides, Sophocles, or Aeschylus. May be repeated for credit.

Greek

Lower Division Courses

1. Elementary Greek (5) I. The Staff
Lecture—4 hours. Students who have successfully completed Greek 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.

2. Elementary Greek (5) II. The Staff
Lecture—4 hours. Prerequisite: course 1. A continuation of course 1.

3. Elementary Greek (5) III. The Staff
Lecture—4 hours. Prerequisite: course 2. A continuation of course 2.

98. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. Group study of selected topics. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

***100. Attic Orators** (4) II. Thompson
Lecture—3 hours. Prerequisite: course 3.

101. Plato (4) I, Thompson
Lecture—3 hours. Prerequisite: course 3.

***102. Euripides** (4) II. Grimm
Lecture—3 hours. Prerequisite: course 101.

103A. Homer: Iliad (4) I. The Staff
Recitation—3 hours; term paper. Prerequisite: course 3.

***103B. Homer: Odyssey** (4) II. The Staff
Recitation—3 hours; term paper. Prerequisite: course 3.

***104. Menander** (4) II. Thompson
Lecture—3 hours; term paper. Prerequisite: course 3.

***105. Demosthenes** (4) II. Thompson
Lecture—3 hours; term paper. Prerequisite: course 3.

***111. Sophocles** (4) III. Grimm
Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.

112. Aristophanes (4) III. Grimm
Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.

***113. Thucydides** (4) I, Thompson
Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.

***114. Lyric Poetry** (4) III. Thompson
Lecture—3 hours. Prerequisite: course 103. Offered in even-numbered years.

***115. Aeschylus** (4) II. Grimm
Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.

***116. Herodotus** (4) I, Thompson
Lecture—3 hours. Prerequisite: course 103. Offered in odd-numbered years.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Thompson in charge)
(P/NP grading only.)

Latin

Lower Division Courses

1. Elementary Latin (4) I. The Staff
Lecture—4 hours. Students who have successfully completed Latin 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.

1X. Intensive Latin (5) II. Traill
Lecture—5 hours. An intensive course designed primarily for graduate students and advanced undergraduates wishing to acquire rapidly a rudimentary knowledge of Latin. Covers the same material as Latin 1 and 2.

2. Elementary Latin (4) II. The Staff
Lecture—4 hours. Prerequisite: course 1. A continuation of course 1.

3. Elementary Latin (4) III. The Staff
Lecture—4 hours. Prerequisite: course 2. A continuation of course 2.

***10. The Structure of Latin** (4) III. Thompson
Lecture—4 hours. Prerequisite: not open to students who have received credit for any other course in Latin. Survey of the Latin language with special emphasis on the morphology and syntactical relationships of classical Latin.

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

Upper Division Courses

***100. Ovid** (4) I, Traill
Lecture—3 hours; paper. Prerequisite: course 3. Translation and discussion of selected readings from the works of Ovid.

***101. Livy** (4) III. Thompson
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

102. Roman Comedy (5) I, Thompson
Lecture—4 hours; term paper. Prerequisite: course 3. Offered in even-numbered years.

103. Vergil: Aeneid (4) I.
Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***104. Sallust** (4) I, Thompson
Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***105. Catullus** (4) I, Grimm
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

***106. Horace: Odes and Epodes** (4) I, Grimm
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

***108. Horace: Satires and Epistles** (4) II. Grimm
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

109. Roman Elegy (4) III. Grimm
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

NOTE: For key to footnote symbols, see page 123.

***111A-111B-111C. Silver Age Latin** (4) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 3. Selections from Tacitus, Pliny, Petronius, Juvenal, Martial, and other writers of the Silver Age. Offered in odd-numbered years.

***112. Cicero: Political Writings** (4) I, Thompson
Recitation—3 hours; term paper. Prerequisite: course 3.

***114. Cicero: Philosophical Works** (4) II.
Lecture—3 hours. Prerequisite: course 3. Offered in odd-numbered years.

***115. Lucretius** (4) II. Traill
Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***116. Vergil: Eclogues and Georgics.** (4) III.
Lecture—3 hours. Prerequisite: course 3. Offered in even-numbered years.

***121. Prose Composition** (5) III. Traill
Lecture—4 hours; term paper.

125. Medieval Latin (4) III. Traill
Lecture—3 hours; term paper. Prerequisite: course 3 and two upper division courses in Latin. Selected readings from the Vulgate and various medieval authors provide an introduction to the developments in the Latin Language and literature from the fourth to the fifteenth centuries. Offered in even-numbered years.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Grimm in charge)
(P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Clinical Pathology

(School of Veterinary Medicine)

Jiro J. Kaneko, D.V.M., Ph.D., Chairperson of the Department

Department Office, 1319 Haring Hall (752-0153)

Faculty

Bernard F. Feldman, D.V.M., Ph.D., Associate Professor
Nemi C. Jain, M.V.Sc., Ph.D., Professor
Donald E. Jasper, D.V.M., Ph.D., Professor
Jiro J. Kaneko, D.V.M., Ph.D., Professor
Michael E. Mount, D.V.M., Ph.D., Assistant Professor
Joseph G. Zinkl, D.V.M., Ph.D., Associate Professor

Part-Time Clinical Faculty

Jeanne Wright George, D.V.M., Ph.D., Assistant Clinical Professor
John W. Switzer, D.V.M., Assistant Clinical Professor

Courses in Clinical Pathology

Upper Division Courses

101. Comparative Hematology (2) III. Kaneko, Jain, Zinkl, Feldman
Lecture—2 hours. Prerequisite: Biological Sciences 1, Physiology 110, Biochemistry 101A-101B or Physiological Sciences 101A-101B or consent of instructor. Principles, interpretation and applications of clinical hematology; comparative blood cellular morphology and function.

101L. Comparative Hematology Laboratory (2) III. Kaneko, Zinkl, Jain, Feldman
Laboratory—6 hours. Prerequisite: course 101 (should be taken concurrently) and consent of instructor. Introduction to laboratory methods and procedures of clinical hematology. Limited enrollment.

102. Clinical Biochemistry (4) II. Kaneko
Lecture—3 hours; laboratory—2 hours. Prerequisite: Physiology 112, 113; Physiological Sciences 101A-101B or Biochemistry 101A-101B, or consent of instructor. Principles and methods of clinical biochemistry; determination and interpretation of the biochemical constituents of the blood, urine and other body fluids.

199. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

204. Normal and Abnormal Bone Marrow Cytology (1) I, Feldman, Zinkl
Lecture-laboratory—2 hours. Prerequisite: Veterinary Medicine 435 or course 101. Normal maturation of hematopoietic cells followed by a study of the cytology of blood and bone marrow in selected diseases of domestic animals including infections, anemias, myeloproliferative disorders and leukemias.

205. Physiology and Pathology of Leukocytes (2) II. Jain
Lecture—2 hours. Prerequisite: course 101, Biochemistry 101A-101B, or consent of instructor. Metabolism, ultrastructure, kinetics, homeostasis, cytochemistry, and functions of different leukocytes; physiological, functional, histochemical and morphological changes in leukocytes in diseases; their role in inflammatory and immunologic processes. Offered in even-numbered years.

206. Immunohematology (2) II. Jain, J. Lewis (Medicine), MacKenzie (Medicine)
Lecture—2 hours. Prerequisite: course 101, Veterinary Microbiology 126, or consent of instructor. Immunologic aspects of hematology; blood cell antigens and antibodies; autoimmune hematologic diseases; reactions to blood transfusions; transplantation mechanisms. Offered in odd-numbered years.

261. The Bovine Mammary Glands in Health and Disease (1) II. Jasper
Lecture—1 hour. Prerequisite: consent of instructor. Relationship of mastitis and milk quality; infectious causes and the influence of environment, milking machines and management on mastitis; pathogenesis of mastitis; cellular and humoral defense mechanisms; mastitis diagnosis and control.

290. Seminar in Clinical Pathology (1) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research in Clinical Pathology (1-12) I, II, III. The Staff
(S/U grading only.)

Clinical Psychology

See Medicine

Community Development (A Graduate Group)

E. Dean MacCannell, Ph.D., Chairperson of the Group

Group Office, 106 Academic Office Building-4 (Applied Behavioral Sciences), (752-6437/0770)

Faculty. Includes faculty members from various departments in the area of community development.

Graduate Study. The Graduate Group in Community Development offers a multidisciplinary program of study which leads to the M.S. degree under both master's degree plans, the thesis or the comprehensive examination. The program is designed to prepare students for professional roles in rural, nonmetropolitan communities and human service organizations as administrators, planners, or technicians. Training in community development is also aimed at preparing an individual to work within government or non-profit organizations working in the realm of social and economic change. There are three areas of specialization: (1) community economic and social development, (2) community program administration and management, and (3) community organization and development.

Preparation. Applicants to this program can prepare themselves by enrolling for upper division courses in the social or behavioral sciences, e.g., anthropology, economics, sociology, psychology, cultural geography, or political science, and courses in community studies.

Graduate Adviser. See *Class Schedule and Room Directory.*

Community Health

See Medicine

Community Nutrition

(College of Agricultural and Environmental Sciences)

The Major Program

Community Nutrition focuses on the psychological, economic, and socio-cultural factors which influence dietary practices and the nutritional status of individuals and groups. The aim of Community Nutrition is the application of this knowledge in the development and implementation of programs to improve the availability and use of food in the community. The major is designed for students who seek to combine a foundation in the biological and nutritional sciences with study in the social sciences. All students in the major are required to complete a common core of preparatory and depth subject matter courses. Students select one of three subject matter options emphasizing socio-cultural, psychological, or economic aspects of food, diet, and nutrition, and an additional area of concentration in consultation with the adviser.

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	**51-53**
Bacteriology with laboratory (Bacteriology 2, 3)	4
Biology (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A, 1B, 8A, 8B)	16
Computer logic or programming (Sociology 40, Consumer Science Engineering 20)	2-3
Cultural social science (Anthropology 2, Geography 2, or Sociology 3)	4
Cultural food habits (Nutrition 20)	4
Oral and written expression (see College requirement)	8
Social research methods (Sociology 46A or Psychology 41)	4
Statistics (Economics 12, Sociology 46B, Statistics 13)	4-5
Depth Subject Matter	**50-51**
Biochemistry 101A-101B or Physiological Sciences 101A-101B	6-7
Food Science and Technology 100A, 100B, 101A, 101B	10

NOTE: For key to footnote symbols, see page 123.

Nutrition 110, 111, 111L, 116A, 116B, 118, 119, 120 27
Physiology 110, 110L 7

Option Subject Matter **40**
Coursework chosen from one of the following three options in consultation with adviser .. 20–25
Additional units in a related social or health science chosen in consultation with adviser 15–20
(May include a minor program in fields such as physical education, environmental toxicology, community development, statistics or the social sciences.)

Behavioral-Psychological Option

Phychology1
Education110 or Psychology 130
Psychology 112 or Human Development 100A or 100B
Psychology 115 or Human Development 100C
Psychology 108
Psychology 129
Psychology 145
Psychology 165
Psychology 168
Psychology 157
Psychology 180A, 180B, 180C
Applied Behavioral Sciences 173
Applied Behavioral Sciences 177
Consumer Science 100
Food Science and Technology 107
Food Science and Technology 117
Sociology 154

Economics and International Development Option

International Agricultural Development 10
Agronomy 21
Economics 1A
Economics 1B
Mathematics 16A
Agricultural Economics 100A, 100B
Agricultural Economics 120
Agricultural Economics 130
Agricultural Economics 151
Agricultural Economics 125
Consumer Economics 141
International Agricultural Development 100A, 100B
International Agricultural Development 110A, 110B
International Agricultural Development 195
Economics 100
Economics 101
Economics 115A, 115B
Economics 118
Economics 123
Economics 162
Economics 130
Consumer Science 100
Anthropology 122
Anthropology 126
Sociology 170
Economics 151A

Socio-Cultural Option

Foreign language (12 or the equivalent strongly recommended)
Anthropology 101
Anthropology 126
Anthropology 141
Anthropology 162
Anthropology 163
Geography 170
Geography 175
Regional courses, choose 8 units from one of the following four areas (alternative courses may be selected in consultation with the adviser)
North America: Anthropology 105A, 106A, 106B, 106C, Geography 121, History 169A, 169B, Sociology 143
Central and South America: Anthropology 105B, Geography 122A, 122B, History 161A, 161B, 162, 163A, 163B, 165, 166A, 166B, 168
Africa: Anthropology 139A, 139B, Geography 125A, 125B, History 115A, 115B, 115C
Asia Anthropology 135, 136, 147, 190, 191, Geography 124, 127, History 137A, 137B, 137C, 138, 190A, 190B, 190C, 191A, 191B, 193, 194A, 194B, 194C, 195
Additional recommended Courses
Applied Behavioral Sciences 151, 152, Community Health 101, 160, 180, 194, Nutrition 114, 116AL, 116BL, 117, 129, 190, 192, 199, 219, Pharmacology 101, Sociology 106

Unrestricted Electives **36–39**

Total Units for Degree **180**

Major Adviser. K.G. Dewey *(Nutrition).*

Graduate Study. For information on graduate study, see page 94 and the *Graduate Announcement.*

Comparative Literature

(College of Letters and Science)

Ruby Cohn, Ph.D., Program Director, (Fall Quarter)
Manfred Kusch, Ph.D., Program Director (Winter and Spring Quarters)

Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

Samuel G. Armistead, Ph.D. *(Spanish)*
Richard N. Coe, Ph.D., F.A.H.A. *(French)*
Ruby Cohn, Ph.D. *(Comparative Literature, Dramatic Art)*
Peter A. Dale, Ph.D. *(English)*
[2]Manfred Kusch, Ph.D. *(French, Comparative Literature)*
Daniel Rancour-Laferrière *(Russian)*
Peter M. Schaeffer, Ph.D. *(German)*
Robert M. Torrance, Ph.D. *(Comparative Literature)*
[2,4]Marian B. Ury, Ph.D. *(Comparative Literature)*
Hugo J. Verani, Ph.D. *(Spanish)*

Faculty

Samuel G. Armistead, Ph.D., Professor *(Spanish)*
Richard N. Coe, Ph.D., Professor *(French)*
Ruby Cohn, Ph.D., Professor *(Comparative Literature; Dramatic Art)*
Peter A. Dale, Ph.D., Associate Professor *(English)*
[1]Roland W. Hoermann, Ph.D., Professor *(Comparative Literature, German)*
[2]Manfred Kusch, Ph.D., Associate Professor *(French, Comparative Literature)*
Peter M. Schaeffer, Ph.D., Professor *(German)*
Robert M. Torrance, Ph.D., Professor
[2,4]Marian B. Ury, Ph.D., Associate Professor

The Major Program

Few people would think of studying only English physics, German biology, French painting, or Spanish music. Yet most literature majors study books originally written in a single language. Comparative Literature, on the other hand, encourages students to read, and to think about, and to compare books from different national languages and from different parts of the world—from Italy and Russia as well as England and the United States, and from Asia and Latin America as well as North America and Europe.

Comparative Literature thus enlarges students' horizons by bridging the divisions between national cultures instead of concentrating on a single tradition. Both the major and minor programs allow students to combine courses in one or more national literature departments together with courses in Comparative Literature. Students who enjoy reading books, exploring ideas, and learning about different civilizations will find Comparative Literature a stimulating field of study.

The introductory course sequence, "Great Books of Western Civilization," provides both an overview of European literary culture from ancient times to the present and intensive practice in analytical thought and English composition. All readings in undergraduate Comparative Literature courses are in English, but majors take upper division courses in at least one foreign literature in the original language. No foreign language is required for the minor.

Students majoring in Comparative Literature choose a first and a second literature of concentration, one of which may be English. After the introductory sequence, each student's major course work is divided between courses in the two literatures of concentration and Comparative Literature courses. These Comparative Literature courses encourage students to take a broad view of a historical period, a theme, a genre, or a literary movement. The wide variety of options in the program permits great flexibility and encourages interdisciplinary connections between literature and philosophy, psychology, history, and the arts. Each student's plan of study must be approved by an adviser at the beginning and end of each academic year.

Career Alternatives. Careers directly related to Comparative Literature include teaching, journalism, publishing, and translating. Most Comparative Literature majors, however, are preparing for other careers that will employ the skills they have learned in the process of acquiring a stimulating and enriching education. The major in Comparative Literature gains useful experience in one or more foreign languages, in careful analytical thinking, and in precise use of the English language. Because many professional schools consider a literature major an excellent background for their graduate disciplines, Comparative Literature provides valuable preparation (along with supplementary courses outside the major) for careers in business, government, medicine, or law.

Comparative Literature

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**12-42**
Comparative Literature 1, 2, 3	12
Foreign language: sufficient preparation to insure satisfactory performance at the upper division level	0-30
Depth Subject Matter	**40**
Seven upper division courses (in original languages, one of which may be English) distributed between the first and second literatures of concentration with the approval of the adviser	28
Comparative Literature 141	4
Two additional upper division Comparative Literature courses, preferably including one in a major literary period or movement	8
Total Units for the Major	**52-8**

Recommended
Art 10HA; Dramatic Art 20; Classics 10, 40, 41; History 4A, 4B, 4C; Philosophy 21, 22, 23.

Major Adviser. R. Cohn *(Comparative Literature),* (Fall Quarter); M. Kusch *(French),* (Winter and Spring Quarters).

All Comparative Literature majors and minors must consult with their adviser, individually, at least once at the beginning and once at the end of each academic year.

Minor Program Requirements:

The minor in Comparative Literature allows students to combine courses in Comparative Literature with courses in one or two national literatures, including English and foreign literatures in translation. There is no language requirement for the minor.

	UNITS
Comparative Literature	**24**
Comparative Literature 1, 2, or 3	4
Two upper division Comparative Literature courses (Comparative Literature 141 strongly recommended)	8
Three upper division courses in one or two national literatures (including English)	12
Courses should form a coherent program, with emphasis on a historical period, genre, or literary movement, and should be chosen in consultation and with the approval of the adviser.	

Minor Adviser. Same as for Major Adviser.

All Comparative Literature majors and minors must consult with their adviser, individually, at least once

NOTE: For key to footnote symbols, see page 123.

at the beginning and once at the end of each academic year.

Teaching Credential Subject Representative. M. Kusch. See page 98 for the Teacher Education Program.

Graduate Study. Refer to the Graduate Group in Comparative Literature (page 164).

Courses in Comparative Literature

Lower Division Courses

1. Great Books of Western Civilization: From Myth to Faith (4) I, II, III. Director in Charge
Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. An introduction, through class discussion and frequent written assignments, to some of the great books of western civilization from *The Epic of Gilgamesh* to St. Augustine's *Confessions*.

2. Great Books of Western Civilization: From Faith to Reason (4) I, II, III. Director in charge
Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. An introduction, through class discussion and frequent written assignments, to some of the great books of western civilization from Dante's *Inferno* to Swift's *Gulliver's Travels*.

3. Great Books of Western Civilization: The Modern Crisis (4) I, II, III. Director in charge
Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. An introduction, through class discussion and frequent written assignments, to some of the great books of western civilization from Goethe's *Faust* to Beckett's *Waiting for Godot*.

4. The Short Story and Novella (4) II. Ury
Lecture-discussion—3 hours; term paper. An introduction to shorter forms of prose fiction by major authors of different countries, with especial emphasis on the modern period.

5. Fairy Tales, Fables, and Parables (3) III. The Staff
Lecture-discussion—3 hours. An Introduction to fairy tales, fables, and parables as recurrent forms and motifs in literature, with readings from such diverse writers as Aesop and Grimm, Chaucer and Shakespeare, Kafka and Borges.

6. Myths and Legends (3) I. The Staff
Lecture-discussion—3 hours. An introduction to the comparative study of myths and legends, excluding those of Greece and Rome, with readings from Near Eastern, Teutonic, Celtic, Indian, and Japanese literary sources.

7. Literature of Fantasy and the Supernatural (3) II. The Staff
Lecture-discussion—3 hours. An inquiry into the interrelations between the fantastic and the real in the literature of dream and hallucination, fabulous landscapes and voyages, grotesque satire, and gothic horror.

8. Utopias and their Transformations (3) III. The Staff
Lecture-discussion—3 hours. A consideration, in literary works from different ages, of visionary and rational variations on the perfection of a lost paradise, Golden Age, or Atlantis—and of the inhuman nightmares that occasionally result from perversions of the utopian dream.

10A-N. Master Authors in World Literature (2) I, II, III. The Staff (Director in charge)
Lecture-discussion—1 two-hour session. Designed primarily to acquaint the non-literature major with a cross-section of writings by the world's most important authors; readings in English translation. Content alternates among the following segments: **(A)** *Gilgamesh, Ramayana, Beowulf, Nibelungenlied;* **(B)** *Metamorphoses, Decameron, Arabian Nights, Canterbury Tales;* **(C)** *Chanson de Roland, El Cid, Igor's Campaign, Morte D'Arthur;* **(D)** Sakuntala, Tristan and Isolde, Aucassin and Nicolette, Gawain and the Green Knight; **(E)** Swift, Rabelais, *La Celestina, Simplicissimus;* **(F)** Cervantes, Saikaku, Fielding, Voltaire; **(G)** Machiavelli, Shakespeare, Lope de Vega/Calderon, Molie /Racine, Lessing/Schiller; **(H)** Goethe, Byron, Stendhal, Pushkin, Lermontov; **(I)** Hoffmann, Gogol, Poe, Hawthorne, Maupassant, Chekhov, Melville; **(J)** Flaubert, Twain, Turgenev, Galdos, Ibsen; **(K)** Balzac, Dostoevski/Tolstoi, Hardy, Shaw, Strindberg; **(L)** Unamuno, Svevo, Conrad, Gide, Kafka, Faulkner; **(M)** Rilke/Yeats, Joyce/Woolf, Mann/Celine, Bulgakov/Tanizaki, O'Neill/Brecht, Lorca/Pirandello; **(N)** Camus/Sartre, García Márquez/Grass, Borges/Sarraute, Bellow/Nabokov, Beckett/Pinter, Genet/Dürrenmatt. May be repeated for credit in different subject area. Limited enrollment. (P/NP grading only.)

***13. Dramatic Literature** (4) III. Cohn
Lecture-discussion—3 hours; term paper. An introduction, through careful reading of selected plays, to some of the major forms of drama from the earliest tragedies of ancient Greece to the contemporary theater of the Absurd.

***15. The Spiritual Quest** (3) I, Torrance
Lecture-discussion—3 hours. An exploration of the unending search to discover—or to create—a transcendent meaning and purpose in human life, as reflected in such works as the *Bhagavad Gita, The Quest of the Holy Grail,* Dante's *Purgatory,* and Melville's *Moby Dick*.

***20. Man and the Natural World** (4) III. Torrance
Lecture-discussion—3 hours; term paper. Examination of the changing relationship between the individual human being and his "natural" environment, whether cultivated or wild, as reflected in literary works from ancient times to the present by such authors as Hesiod, Virgil, Rousseau, Wordsworth, and Thoreau.

53A. Literature of China and Japan (3) I, Ury
Lecture—2 hours; discussion—1 hour. Introduction to representative masterpieces of East Asia with readings from such works as *The Story of the Stone, The Peach Blossom Fan,* T'ang and Sung poetry, classical Japanese poetry, drama, and travel diaries, and *The Tale of Genji*.

53B. Literature of India and Southeast Asia (3) II. Ury
Lecture—2 hours; discussion—1 hour. Introduction to representative masterpieces of South Asia with readings from such works as the *Mahabharata* and *Ramayana, The Cloud Messenger, Shakuntala, The Little Clay Cart,* and the stories and poems of both ancient and modern India and Southeast Asia.

98. Directed Group Study (1-5) I, II, III. The Staff (Director in charge)
Restricted to lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Director in charge)
(P/NP grading only.)

Upper Division Courses

135. Women Writers (4) II. Ury
Lecture-discussion—3 hours; term paper. An exploration of women's differing views of self and society as revealed in major works by female authors of various times and cultures. Readings, principally of fiction, will include such writers as Lady Murasaki, Mme de Lafayette, and Charlotte Bronte.

***140. Thematic and Structural Study of Literature** (4) II. The Staff (Director in charge)
Lecture-discussion—3 hours; term paper. Interpretation of selected works illustrating the historical evolution of themes, as well as of formal and structural elements.

141. Literary Theory and Criticism (4) III. L. Schleiner
Lecture-discussion—3 hours; term paper. Exploration of literary theories with emphasis on specific objectives and possibilities of comparative literature.

***142. Critical Reading and Analysis** (4) I. The Staff (Director in charge)
Lecture-discussion—3 hours; term paper. Prerequisite: consent of instructor. Close reading of selected texts: scrutiny of very limited amount of material, with attention to the problems of texts in translation.

153. The Forms of Asian Literature (4) II. Ury
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: upper division standing. Introduction to distinctive Asian literary forms, such as *haiku, noh,* the Chinese novel and tale, through reading of major works. Comparison with Westem genres and study of native and Western critical traditions.

***158. The Detective Story as Literature** (4) I, Coe
Lecture—3 hours; term paper. Study of the origins, literary and social background, development and implications of the literature of detection in a comparative context.

159A-G. Special Topics in Comparative Literature (4) I, II, III. The Staff (Director in charge)
Lecture-discussion—3 hours; term paper. Intensive study of selected subjects: **(A)** The Play Within the Play; **(B)** The Lyrical Novel; **(C)** Women in Literature; **(D)** The Role of Philosophy in Literature; **(E)** The Role of Psychology in Literature; **(F)** The Religious Experience in Literature; **(G)** Literary Attitudes and Judgment. May be repeated for credit in different subject area.

***160A. The Modern Novel** (4) I, Torrance
Lecture-discussion—3 hours; term paper. The changing image of man and his world as seen in novels by such writers as Joyce, Proust, and Mann.

160B. The Modern Drama (4) II. Cohn
Lecture-discussion—3 hours; term paper. Readings in representative authors such as Ibsen, Strindberg, Chekhov, Pirandello and Brecht.

***161A. Tragedy** (4) I, Cohn
Lecture-discussion—3 hours; term paper. Persistent and changing aspects of the tragic vision in literature from ancient times to the present.

***161B. Comedy** (4) II. Cohn
Lecture-discussion—3 hours; term paper. Comic attitudes towards life in literary works of different ages.

***161C. Tragicomedy** (4) III. Cohn
Lecture-discussion—3 hours; term paper. A survey of works in the mixed mode from ancient times to the present.

***163. Biography and Autobiography** (4) III. Coe
Lecture-discussion—3 hours; term paper. Portrayals of a human life in biographies and/or autobiographies of different countries and ages. Offered in odd-numbered years.

164A. The Middle Ages (4) III. Armistead
Lecture-discussion—3 hours; term paper. Readings in heroic epics, chivalric romances, and such major authors as Dante and Chaucer, with emphasis on shared assumptions concerning man's place in the world.

***164B. The Renaissance** (4) II. Torrance
Lecture-discussion—3 hours; term paper. Readings in major authors such as Petrarch, Machiavelli, Erasmus, Montaigne, Rabelais, Cervantes, and Shakespeare, with particular emphasis on changing conceptions of the possibilities and limitations of man.

***164C. Baroque and Neoclassicism** (4) III. Torrance
Lecture-discussion—3 hours; term paper. Readings in major authors such as Calderon, Corneille, Pascal, Racine, Milton, and Grimmelshausen, with consideration of the tension between the expansive energies of the "baroque" and the restraints of dogma and reason.

164D. The Enlightenment (4) II. Coe
Lecture-discussion—3 hours; term paper. Readings in major authors such as Swift, Voltaire, Rousseau, Sterne, and Kant, with emphasis on philosophical ideas and literary forms.

166A. The Epic (4) II. Armistead
Lecture-discussion—3 hours; term paper. Study of various forms of epic poetry in both the oral and literary traditions. May be repeated for credit in different subject area.

166B. The Novel (4) III. Dale
Lecture-discussion—3 hours; term paper. Readings in various forms of the novel such as the picaresque, the developmental, and the confessional, with emphasis on the evolution of the genre. May be repeated for credit in different subject area.

167. Comparative Study of Major Authors (4) I, Schaeffer
Lecture-discussion—3 hours; term paper. Prerequisite: consent of instructor. Pivotal works of artists in the Western mainstream, such as Dante, Shakespeare, Cervantes, Goethe, Tolstoi, Proust, and Joyce.

***168A-C. Modern Literary Movements and Styles** (4) I. The Staff (Director in charge)
Lecture-discussion—3 hours; term paper. Prerequisite: consent of instructor. Studies in major literary movements of the modern period: **(A)** Romanticism; **(B)** Symbolism; **(C)** Realism and Naturalism. May be repeated for credit in different subject area.

169. The Avant-Garde (4) I. Cohn
Lecture-discussion—3 hours; term paper. Studies in movements such as surrealism, expressionism and the absurd.

197T. Tutoring in Comparative Literature (2-4) I, II, III. Hoermann
Discussion—2-4 hours. Prerequisite: upper division standing with declared major in Comparative Literature. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with current courses offered by Comparative Literature. May be repeated for credit for a total of 6 units. (P/NP grading only.)

198. Directed Group Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)
(P/NP grading only.)

Graduate Courses

200. Introduction to the Graduate Study of Comparative Literature (4) I. Kusch
Seminar—3 hours; research paper. Prerequisite: reading knowledge of one foreign language. Introduction to research tools, library resources, and critical concerns of Comparative Literature, with focus on the comparative study of a single work, culminating in a related research project.

***201. Theories of Comparative Literature** (4) II. Torrance
Seminar—3 hours; research paper. Prerequisite: reading knowledge of one foreign language; course 141 or the equivalent recommended. An examination of international theories of literature with reference to language, genre, thematics, social and historical context.

250A. Research in Comparative Literature (4) I, II, III. The Staff (Director in charge)
Individual instruction—1 hour. Prerequisite: course 200. Individually guided research, under the supervision of a faculty member, in a comparative topic culminating in a term paper. Required of M.A. and Ph.D. candidates.

NOTE: For key to footnote symbols, see page 123.

250B. Research in Comparative Study of Author, Period, or Genre (4) I, II, III. The Staff (Director in charge)
Individual instruction—1 hour. Prerequisite: course 200 and 201. Individually guided research, under the supervision of a faculty member, in the specialized study of an individual author, historical period, or literary genre culminating in a term paper. Required of Ph.D. candidates.

250C. Basic Research for the Dissertation (4) I, II, III. The Staff (Director in charge)
Individual instruction—1 hour. Prerequisite: course 200 and 201. Individually guided research, under the supervision of a faculty member, in preparation for the dissertation in Comparative Literature. Required of Ph.D. candidates.

299. Individual Study (1-12) I, II, III. The Staff (Director in charge)
(S/U grading only.)

299D. Special Study for the Doctoral Dissertation (1-12) I, II, III.
(S/U grading only.)

Comparative Literature (A Graduate Group)

Ruby Cohn, Ph.D., Chairperson of the Group (Fall Quarter), (752-1453)
Manfred Kusch, Ph.D., Chairperson of the Group (Winter and Spring Quarters), (752-6023)

Group Office, 912 Sproul Hall (752-1219)

Graduate Study. The Comparative Literature Program offers the M.A. and Ph.D. degrees with a strong emphasis on individual research under the supervision of a faculty member. The M.A. degree is awarded under both master's programs, Plan I or Plan II (see page 96). Candidates for the M.A. combine study of Comparative Literature with study of two literatures in the original languages, one of which may be English. Ph.D. candidates, in addition to further research of a comparative nature, study three literatures in the original languages, acquiring an extensive knowledge of the overall development of one. Within this framework, each student's program will be tailored to individual interests, and may center on a major historical period, such as the Renaissance or the modern age; a genre, such as drama, fiction, or criticism and theory; the relationships between literature and the arts, linguistics, philosophy, or psychology.

Preparation. For admission to the Program, M.A. candidates should have an undergraduate major in literature and reading ability in one foreign language. Ph.D. candidates should have an undergraduate major in literature and reading ability in two foreign languages. The Group requires three letters of recommendation and a sample of recent written work, and it is recommended that students submit their GRE scores.

Graduate Adviser. R. M. Torrance *(Comparative Literature).*

Comparative Pathology (A Graduate Group)

Richard Yamamoto, Ph.D., Chairperson of the Group

Group Office, 1126 Haring Hall (752-1385)

Graduate Study. The Graduate Group in Comparative Pathology offers the M.S. and Ph.D. degrees for graduate study in disciplines concerned with various aspects of disease processes and their effects upon individuals and populations. Comparative Pathology has evolved in recent years from a primary concern with diseases of humans and of those animals having an economic, husbandry, or companion value to encompass most forms of animal life. The unifying central theme in this broadly based major is, by definition, "the study of disease." To this study is brought a wide array of scientific disciplines so that students with divergent interests and backgrounds can be accommodated in programs designed for individual needs.

This program is primarily designed for students who have a professional medical degree, i.e., D.V.M., M.D., D.D.S. These students usually select programs which emphasize pathology, epidemiology, or host-parasite interactions.

Students may also be admitted on the basis of a bachelor's degree in some field of, or related to, biological science. The latter trainees will become biologists, who, in addition to the usual backgrounds expected of such persons, will also have an appreciation of disease; an ability to design meaningful experiments relating to both normal and pathological processes; and a breadth of understanding allowing the use of diverse species of living organisms, such as invertebrates, fish, terrestrial wildlife or marine organisms.

Beyond core courses selected for both the M.S. and Ph.D. degrees from anatomy, bacteriology, genetics, immunology, parasitology, pathology, physiology, and virology, course programs are intentionally very flexible. The goal is that each student will specialize in one field of principal interest and attain competence in one or more related areas.

Graduate Adviser. H.J. Olander *(pathology).*

Computers

See Engineering: Electrical and Computer, page 183.

Computer Science

Computer Science and Engineering (see page 184); Computer Science and Mathematics, Computing Science (see below); see also Engineering: Electrical and Computer (pages 183, 194)

Computer Science and Mathematics

(College of Letters and Science)

The Major Program

The Computer Science and Mathematics major is designed to prepare students for careers involving the design of computer systems and their application to science, industry and management. Students taking this major receive solid grounding in fundamentals of languages, operating systems, and the formal tools of analysis required to use the computer in solving complex tasks in today's society. Emphasis in this major is on software, although introductory architecture is included. The program also provides opportunities for students to choose electives both in the College of Letters and Science and in the College of Engineering. The program will also prepare students for advanced work in computer science or in other disciplines requiring advanced knowledge of the use of computers.

For students interested in the engineering aspects of computer science, see Engineering Computer Science (page 184).

Computer Science and Mathematics

B.S. Major Requirements:

Preparatory Subject Matter **27**
Engineering Computer Science 8, 80, Mathematics 21A-21B-21C, 22A-22B, 108 27

Depth Subject Matter **48–49**
Engineering Computer Science 121, 123, Electrical and Computer Engineering 170, 180, Mathematics 139A,167 20
(Electrical and Computer Engineering 170 and 171 alternative to Engineering Computer Science 121 and Electrical and Computer Engineering 170)
Minimum of nine additional units selected from Engineering Computer Science 124, 125, 126, 127, 128, 129 9
Minimum of ten additional units selected from Mathematics 128A, 128B, 128C, 131, 132A, 132B, 140, 168, Statistics 131A, 131B, 131C 10
Nine units of Engineering Computer Science or Mathematics courses as approved by adviser 9

Total Units for the Major **75–76**

Major Advisers. G.L. Fisher and P. Linz (*Engineering Computer Science*).

Graduate Study. See page 94.

Computing Science (A Graduate Group)

Richard F. Walters, Ph.D., Chairperson of the Group

Group Office, 4455 Chemistry Annex (Division of Computer Science) (752-7004)

Faculty.

Includes faculty members from the Division of Computer Science, and departments on the Davis campus offering computer programs and courses; the Applied Science Department, Davis-Livermore, and associated staff of the Lawrence Livermore Laboratory; and the Computer Science Department, California State University, Chico.

Graduate Study. The Graduate Group in Computing Science offers programs of study leading to the M.S. (both plans offered: comprehensive examination or thesis) and Ph.D. degrees. Research and instruction is multidisciplinary in the areas of computer design and architecture; information systems; and application of computers to the biological and medical sciences, to physical and social sciences and to engineering.

Preparation. Students with backgrounds in some field other than computers are encouraged to apply. Master's level students must demonstrate undergraduate level proficiency in six areas of computing science: computer architecture and hardware, operating systems, languages and programming, formal basis for computing science, software engineering and database systems, and numerical analysis. Students must take advanced courses in at least three of the six areas, and may either pass examinations in two areas or complete a thesis

NOTE: For key to footnote symbols, see page 123.

approved by the Educational Policy Committee. Ph.D. candidates must either pass three subject area examinations at a high pass level or substitute an oral examination covering these areas, and complete a thesis on a topic approved by the Graduate Group.

Graduate Advisers. C.U. Martel, N.S. Matloff.

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 167); and see page 94.

Related Courses. See Agricultural Economics.

Courses in Consumer Economics

Questions pertaining to the following courses should be directed to the instructor or to the Department of Agricultural Economics, 105 Voorhies Hall.

Upper Division Courses

141. Consumers and the Market (4) II. Kushman
Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. The structure of the market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers. Students who have had or are taking Agricultural Economics 100A, Economics 100, or the equivalent may receive only 3 units of credit, so must enroll in course 141M.

141M. Consumers and the Market (3) II. Kushman
Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. The structure of the market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers. Students who have had or are taking Agricultural Economics 100A, Economics 100, or the equivalent must enroll in this course (for 3 units) rather than course 141.

142. Personal Finance (3) I, Shepard; III, ———
Lecture—3 hours. Prerequisite: Economics 1B. Management of income and expenditures by the household. Use of consumer credit, savings, and insurance by households. Principles of tax, retirement, and estate planning. (Same course as Agricultural Economics 142.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

220. Economics of Consumer Policy (3) III.
Lecture—3 hours. Prerequisite: one graduate course in economic theory and one course in econometrics or the equivalent. Policy criteria; sources of market failure; consumer policy alternatives; empirical evaluation of selected economic policies.

258. Economics of Consumption (3) II. Heien
Lecture—3 hours. Prerequisite: one graduate course in micro-economic theory. Advanced analysis of individual and aggregate consumption models; empirical determinants of consumer behavior; application of consumption economics to selected issues.

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Current issues in consumer economics and the economics of consumption.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Consumer Food Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Consumer Food Science major emphasizes both the biological properties of foods and the socioeconomic and cultural aspects of foods as they relate to consumer acceptability and use. Students are provided with sufficient range in study of the biological, natural, and social sciences to prepare them for careers such as food product development, quality assurance, marketing and sensory analysis, extension service, consumer communication, and community service. The major provides academic preparation for those who plan to pursue similar careers or to undertake graduate study in Food Science or Nutrition.

Consumer Food Science

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**60-61**
Biochemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B)	6-7
Biology with laboratory (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A-1B-1C, 8A-8B)	21
Mathematics and physics (Computer Science Engineering 20, Physics 10)	7
Microbiology with laboratory (Bacteriology 2, 3)	4
Physiology (Physiology 110)	5
Statistics (Agricultural Science and Management 150)	4
Written and oral expression (see College requirement)	8
Depth Subject Matter	**48**
Community nutrition (Nutrition 118)	3
Consumer economics (Consumer Economics 141)	4
Food Science and Technology including 100A, 100B, 101A, 101B, 107, Nutrition 20 or 120, and one additional course each in food toxicology, food microbiology, and food processing (Food Science and Technology 128, 104, 111)	28
Human nutrition with laboratory (Nutrition 110, 111, 111L)	10
Consumer Science 135	3
Breadth Subject Matter	**29**
Principles of economics (Economics 1A-1B)	10
Consumer behavior (Consumer Science 100)	3
Agricultural Economics 112	4
At least one course from two different areas: agricultural economics, applied behavioral sciences, cultural anthropology, psychology, or sociology. Remainder in social sciences and humanities electives	12
Restricted Electives	**20**
Food and consumer related courses selected in accordance with student's educational goal with approval of adviser.	
Unrestricted Electives	**22-23**
Total Units for the Major	**180**

Recommended
It is recommended that students interested in graduate work take Chemistry 5, English 104, Mathematics 16A-16B-16C and Physics 2A-2B-2C.

Major Adviser. B.O. Schneeman *(Nutrition).*

Advising Center for the major is located in 126 Cruess Hall (752-1468).

Graduate Study. Related graduate study and research leading to the M.S. degrees in Food Science or Nutrition is available. See page 94 and the *Graduate Announcement* for details on graduate study.

Consumer Science

(College of Agricultural and Environmental Sciences)

Faculty

See under the Division of Textiles and Clothing, and the Departments of Agricultural Economics and Food Science and Technology.

Major Programs and Graduate Study

Consumer Food Science (this page) and Home Economics (page 231) are related majors; for graduate study, see page 94.

Related Courses. See Consumer Economics, Food Science and Technology, Nutrition, and Textiles and Clothing.

Courses in Consumer Science

Questions pertaining to the following courses should be directed to the instructor or to the Division of Textiles and Clothing, 109 Everson Hall.

Lower Division Courses

47. Food Product Development Field Study (1) III. Schutz
Discussion—three 2-hour sessions; field trip—2 days.To observe commercial aspects of the large-scale development, distribution and evaluation of food products intended for human consumption. Course given between Winter and Spring Quarters and considered a Spring course for preenrollment. Advance enrollment with instructor required. (P/NP grading only.)

92. Internship in Consumer Science (1-12) I, II, III. The Staff (Zeronian in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience on and off campus in a consumer science related area. (P(NP grading only.)

Upper Division Courses

100. Consumer Behavior (3) I, Schutz
Lecture—3 hours. Prerequisite: preparation in areas of psychology or sociology and economics recommended. Provides a set of behavioral concepts and theories useful in understanding consumer behavior on the part of the individual, business, and social organizations. Conceptual model to help guide and understand consumer research will be presented.

135. Principles of Food Product Development (3) I, Schutz
Lecture—3 hours. Prerequisite: one course in introductory food science. Presents basic concepts of product research and development. Organization, activities, new product development, project management. Role of food regulations, consumerism, marketing, advertising, consumer research.

190. Current Topics in Consumer Research (1) I, II. Sommer
Seminar—1 hour; term paper. Prerequisite: upper division standing. One-hour presentations, including time for questions and discussion, by guest speakers from on and off-campus on research findings and practical projects in consumer studies. May be repeated once for credit. (P/NP grading only.)

192. Internship in Consumer Science (1-12) I, II, III. The Staff (Zeronian in charge)
Laboratory—3-36 hours. Prerequisite: completion of a minimum of 84 units; consent of instructor. Work-learn experience on and off campus in a consumer science related area. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Zeronian in charge)
Group study or experimentation on consumer related topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Zeronian in charge)
Individual student reading, library research or experimentation. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

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.

Consumer Technology

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Agricultural Engineering.

Courses in Consumer Technology

Questions pertaining to the following courses should be directed to the instructor or the Department of Agricultural Engineering, 2030 Bainer Hall.

Lower Division Courses

15. Experiments in Creative Woodworking (1) II, III. O'Brien
Laboratory—2 hours. Experimental comparison of techniques for creating objects and structures of wood. Physical principles and properties of woods as related to structural stability, selection and use of tools, and aesthetics in design; finishes to preserve, enhance, or create effects.

16. Experiments in Creative Metalworking (2) III. Garrett
Lecture—1 hour; 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. Layout, cutting, forming, welding and finishing. (P/NP grading only.)

17. Electrical Appliances and Systems (2) III. O'Brien
Lecture—1 hour; laboratory—3 hours. Characteristics and principles of electrical appliances and systems for lighting, heating, and power. Principles of electricity; loads, distribution, and control; safety; planning systems and selecting appliances.

31. Using Calculators and Computers for Records and Problems (1) I, II, III. Jenkins, Yates, Singh
Discussion-laboratory—2 hours. Directed exercises in using computers and computing calculators for solving selected agricultural, management, and production problems. Batch and time-sharing computing methods; programmable desk calculators. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Garrett in charge)
Prerequisite: consent of instructor. Group study of selected topics. Restricted to lower division students. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

Upper Division Courses

101. Engines for Automotive, Agricultural, Residential, and Recreational Use (3) II. Upadhyaya
Lecture—2 hours; laboratory—2 hours. Prerequisite: upper division standing or consent of instructor. Principles of engine construction, operation, performance, and utilization. Properties of fuels, lubricants, and engine exhaust. Principles of combustion, carburetion, and electrical systems.

111. Home Design (1) III. O'Brien
Lecture—1 hour. Prerequisite: upper division standing or consent of instructor. Study of factors to be considered in planning new or remodeled homes. Factors include size, layout, location, orientation, materials, traffic patterns, facilities, aesthetics, cost, and building codes and regulations.

113. Sanitation and Water Supply for Remote Locations (1) III. Hills
Lecture—1 hour. Prerequisite: upper division standing; Physics 2B and Chemistry 1B recommended. Sources of domestic water at remote locations; sanitary precautions; methods and equipment for sanitary disposal of domestic wastes.

113L. Laboratory Studies in Sanitation and Water Supply for Remote Locations (1) III. Hills
Laboratory—3 hours. Prerequisite: course 113 (concurrently). Directed laboratory exercises, field trips, and special projects to augment the study of course 113. (P/NP grading only.)

196. Individual Projects (1-2) I, II, III. Garrett, O'Brien
Prerequisite: consent of instructor. Directed exercises in planning and executing independent projects consistent with the student's abilities. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

Dermatology

See Medicine

Design

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Environmental Design.

The Major Program

Design, as taught and practiced at UC Davis, brings together creativity and ingenuity, and is interdisciplinary in nature. This major attracts students who are interested in studies which will involve them in constructing the future shape of our everyday lives. The program is flexible, changing in content and size to reflect the needs and interests of the students, faculty, and society. Self-directed and motivated students contribute to the character of the Design program. They are guided by the faculty to form individualized programs of study around a core of required courses. Students gain not just knowledge of fundamentals of the design professions as they currently exist, but also the outlook necessary to create new approaches to design, and to the development of design as a social tool. The program provides opportunities to acquire a knowledgeable and sound background in design, the skills to use this effectively, and the confidence to apply these skills to innovative design.

At the present time, this curriculum offers study in the areas of costume, textiles, environments, and courses in visual and graphic imagery. The lower division courses prepare the student in basic design practice and theory. Students are encouraged to develop an upper division program which includes courses from textile design, design of the environment, and wearable design and image making, in order to understand the role of design in the formation of our culture. Students may elect to concentrate in one of these areas. Through individual planning, the program offers flexibility to allow for (1) concentration on a speciality, (2) preparation for graduate programs, (3) general education in design stimulating the creativity of the individual, (4) development toward self-education throughout one's entire life span, and (5) techniques to transmit knowledge or skill to one person or many, whenever the need arises.

The faculty is composed of a diversie group of designers and artists working in the fields of play environment and toys, wearable design and ethnic costume, the study of fantasy, printed imagery and book design, energy-efficient architecture, historical and contemporary textiles, interior design, hand-printed and dyed textiles, constructed textiles, display and exhibition design, building renovation and conversion, contemporary furniture and small art press printing.

Students will be required to keep a continuing portfolio of their creative work to be evaluated by faculty for the purposes of declaring the major, enrolling in orverflow courses, and requesting independent study, internship, or other similar courses.

Prior to declaring Design as a major, students must have completed Design 6, and must have completed or be currently enrolled in preparatory subject matter courses, Design 20A and 20B.

Design

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**12**
Introduction to design, Design 6	4
Drawing, Design 20A	4
Media, Design 20B	4
Depth Subject Matter	**48**
Individualized program of 48 units in Design courses to include at least 36 upper division units (including Design 190), determined by the student and faculty adviser. To include 192 or 199 course units as part of major requirements, the student must have prior approval of faculty adviser and the Master adviser.	
Breadth Subject Matter	**81**
Natural sciences	27
Social sciences	27
Humanities	27
Unrestricted Electives	**39**
Total Units for the Major	**180**

Additional Requirement
Development of a course of study, in consultation with an adviser, no later than the second quarter of the junior year.

Major Adviser. V.Z. Rivers *(Environmental Design)*.

Courses in Design

Questions pertaining to the following courses should be directed to the instructor or to the Advising Center for the major, 152 Walker Hall (752-1165).

Lower Division Courses

6. Introduction to Design (4) II. Laky
Lecture—3 hours; discussion—1 hour. Development of an awareness of the world of design, and a design vocabulary.

20A. Drawing (4) I, II. The Staff (Berteaux in charge)
Studio—8 hours. Drawing for the designer as an aid to perception and communication of ideas, objects, and plans. May be repeated with a different instructor for a total of 8 units.

20B. Media (4) I, III. The Staff
Studio—8 hours; field trip. Introduction to the tools, materials, and techniques used in the designer's studio.

20C. Photographic Media (4) I, II. The Staff (Butler in charge).
Studio—8 hours; field trip. Black and white photography, utilizing natural and artificial light, emphasizing camera operation, processing and printing of 35 mm film. Development of individual visual aesthetics and the understanding of the interaction of technique and image are introduced.

21. Drafting and Perspective (4) I, III. The Staff (Olsen in charge)
Studio—8 hours. Prerequisite: course in drawing recommended. Creation of three-dimensional designs on two-dimensional surfaces.

22. Basic Imagery (4) I. The Staff (Butler in charge)
Studio—8 hours. Prerequisite: courses 6, 20A, 20B. Presentation of the fundamentals of designed images, combining a theoretical perspective with practice using the components of visual literacy. Specific focus upon (1) abstract structure, (2) symbolism, and (3) representation.

23. Personal Adornment (4) I, Shawcroft
Studio—8 hours; field trip. Exploration of the human image altered through ornament and its relation to the human structure.

24. Hand Constructed Textiles (4) II. Shawcroft
Studio—8 hours; one or two field trips. Prerequisite: courses 6, 20A, 20B. Contemporary approach to textile techniques of construction such as netting, plaiting, knotting and basketry.

25. Reproduction Graphics (4) II. The Staff (Butler in charge)
Studio—8 hours; field trip. Prerequisite: courses 6, 20A or 20B, and 20C. Basic studio and photographic skills for the

NOTE: For key to footnote symbols, see page 123.

designer; continuous tone, line and halftone films, mechanical and four-color screen separations.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Olsen in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

121. Design Delineation (4) II. Berteaux
Studio—8 hours; field trip. Prerequisite: courses 20A, 20B, and 21. Exploration of the process of delineation, including principles of perspective drawing, rapid visualization techniques (the quick sketch), rendering and graphic presentation methods.

124. Textile Structures (4) III. Laky
Studio—8 hours; field trip. Prerequisite: course 23 or 24. Art and science of hand building structures in flexible materials. Studio projects in experimental two- and three-dimensional forms with some emphasis on relationships to architecture, furniture and interiors.

126. Visual Presentation (4) II. Gotelli
Studio—8 hours; two field trips. Prerequisite: courses 6, 20A, 20B. Study of display and exhibition design. Emphasis on concepts and techniques of three-dimensional design, including visual exhibit and museum installation.

130. Model Construction (4) III. Berteaux
Studio—8 hours; field trip. Prerequisite: course 21. Theory and visualization of design problems related to furniture, interiors, exteriors, and play ground equipment integated in and expressed by construction and presentation of working models from drawings.

131. Layered Textiles (4) III. Shawcroft
Studio—8 hours; one or two field trips .Prerequisite: background in drawing, personal adomment 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.

132A. Loom-Constructed Textile Design (4) II. The Staff (Laky in charge)
Studio—8 hours; field trip. Prerequisite: course 23 or 24. Principles and practice of loom weaving. Influences of materials and techniques on pattern and form. Experimental projects in contemporary and traditional woven structures. Some emphasis on interior, wearable and computer-aided design.

132B. Loom-Constructed Textile Design (4) III. The Staff
Studio—8 hours; field trip. Prerequisite: course 132A. Principles and practice of loom weaving. Influences of materials and techniques on pattern and form. Experimental projects in contemporary and traditional woven structures. Some emphasis on interior, wearable and computer-aided design.

133A-133B-133C. Visual Metaphor (4-4-4) I, II, III, The Staff (Butler in charge)
Studio—8 hours; field trip (133C only). Prerequisite: courses 20C, 22, 25. Study and practice of image generation and production with emphasis on clarity of visual expression, the perception and use of color, and visual composition in the three-dimensional context.

134. Environmental Design (4) I, Berteaux
Studio—8 hours; one or two field trips. Prerequisite: courses 21, 130 recommended. Exploration of specific problems in interior form and exterior space such as: design for the disabled; and contemporary urban problems.

135. Furniture Design (4) III. The Staff (Olsen in charge)
Studio—8 hours; one or two field trips. Prerequisite: course 21; course 180A recommended. Development of furniture for interior and exterior spaces. Includes behavioral and physical requirements; cultural and historical expression; structural and aesthetic considerations.

140A. History of Design (3) I. The Staff (Butler in charge)
Lecture—3 hours. Prerequisite: Art 1A (may be taken concurrently). The history of Western design from Ancient Egypt and the Middle East through the Aegean and Classical civilizations to the waning of the Middle Ages.

140B. History of Design (3) II. The Staff (Butler in charge)
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, Rivers
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) II. The Staff (Rivers in charge)
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) III. The Staff (Stabb in charge)
Lecture—3 hours; discussion—1 hour; field trip. Prerequisite: one course in art history. History of costume design from the earliest times to the present with emphasis on both aesthetic and functional aspects.

144. History of Interior Design (4) III. The Staff (Gotelli in charge)
Lecture—4 hours. Prerequisite: course 140A and Art 1C or the equivalent. History of interior design in Europe and America from the classical period to modern times. Emphasis on the dwelling in its cultural setting and the development of the theory of modern interior design.

160A-160B-160C. Textile Design (4-4-4) A: I, III; B: I, II; C: III. The Staff (Rivers in charge)
Studio—8 hours; one or two field trips. 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. The Staff (Stabb in charge)
Studio—8 hours; field trip. Prerequisite: courses 20A and 23. 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, II, III. The Staff (Olsen in charge)
Studio—8 hours; one or two field trips. Prerequisite: course 21. 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) I, II, III. The Staff (Olsen in charge)
Seminar—2 hours. Prerequisite: design major or consent of instructor. (P/NP grading only.)

191A-D. Workshops in Design (4-12) I, II, III. The Staff (Olsen in charge)
Seminar—1 hour; studio or field experience—3 hours per unit. Instructor and student determine units. Prerequisite: course 20A, 20B; upper division standing and consent of instructor. Faculty initiated workshops featuring advanced studies and applications of original work in Design: **(A)** Costume; **(B)** Environment; **(C)** Graphics: **(D)** Textiles. Credit limited to 12 units in one section or a combination of sections. Letter grading by contract.

192. Internship (1-6) I, II, III summer. The Staff (Olsen in charge)
Field placement—3–9 or 3–18 hours. Prerequisite: completion of 84 units and consent of instructor. Supervised internship, off and on campus, in areas of design including environmental, costume, textile, museum, display and interior design. Enrollment limited to 3 units per quarter or 6 units per summer session.(P/NP grading only.)

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

199. Special Study of Advanced Undergraduates (1-5) I, II, III. The Staff (Olsen 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 students 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 students to prepare for further studies at the graduate level as well as to pursue career opportunities in government agencies on all levels, nonprofit organizations, social agencies, research organizations, and with firms employing economists with this background. New directions of economic application of theory and research to social problems are reflected. Flexibility is provided by options which allow you to focus either on the *natural and agricultural sciences* or on the *social sciences.*

Students are not admitted directly into the Development, Resource, and Consumer Economics major, but enter the program by filing a Change of Major Petition after fulfilling minimal admission standards of the major. The admission standards consist of satisfactory grades in selected lower division courses. Students who are interested in the major are strongly encouraged to consult with the Advising Center for the major (see below) at their earliest opportunity.

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	**40**
Written and oral expression (See College requirement, page 71)	8
American History and Institutions†	8
Economic principles (Economics 1A-1B)	10
Statistics (Statistics 13, 103)	8
Mathematics, including calculus	6
Depth Subject Matter††	**31-33**
Theory, Agricultural Economics 100A-100B, Economics 101 or 135	11-13
Quant methods, Agricultural Economics 106, 155	8
Policy and Planning: choose four courses from Agricultural Economics 120, 148; Economics 125A, 125B, 130, 131, 150B; Applied Behavioral Sciences 151, 152; Political Science 100, 174; Environmental Studies 160, 168A, 168B, or the equivalent	12
Breadth Subject Matter††	**32**
Natural sciences (including mathematics beyond Preparatory Subject Matter above) and agricultural and environmental sciences (excluding agricultural economics, consumer economics, and applied behavioral sciences)	12 units minimum
Social sciences (excluding economics), history, and philosophy	20 units minimum
Restricted Electives	**24**
Specialization requirement: (a) Select one or more from the following in the designed area of specialization‡	
Development economics: Agricultural Economics 108, 148;	
Natural resource economics: Agricultural Economics 108, 176;	
Human resource economics: Agricultural Economics 150;	
Consumer economics: Consumer Economics 141 Agricultural Economics/Consumer Economics 142.	

†Students meeting the American History and Institutions requirement may substitute Social Science as interpreted under the Social Sciences Breadth Subject Matter requirement.

††Students graduating with this major are required to attain at least a C average (2.0) in all upper division Agricultural Economics, Consumer Economics, and Economics courses, plus any other upper division courses taken at the University which are specialization requirements.

‡Additional restricted electives to be recommended by adviser.

NOTE: For key to footnote symbols, see page 123.

(b) 4 units of Agricultural Economics 190A-190B or 4 upper division units of restricted electives.

Unrestricted Electives **51-53**

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.

Advising Center for major is located in 105 Voorhies Hall.

Major Adviser. L.E. Shepard *(Agricultural Economics).*

Dietetics

(College of Agricultural and Environmental Sciences)

The Major Program

The Dietetics major provides the student 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. Students will be qualified for admission to graduate programs in dietetics, nutrition science, public health nutrition and food service management. Clinical Dietetics, Community Nutrition, and Food Service Management are the three options available with the Dietetics major.

Dietetics

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equal or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

UNITS

Preparatory Subject Matter **42-50**
Written and oral expression (English I and Rhetoric 1 or 3) 8
Statistics (Statistics 13 or Economics 12) 4-5
Physics (Physics 1A-1B or 2A-2B-2C or 10 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 Consumer Science Engineering 20) 1-3

Depth Subject Matter **61-63**
Biochemistry (Biochemistry 101A, 101B) 6
Physiology (Physiology 110, 110L) 7
Food Science and Technology 100A, 100B, 101A, 101B 10
Nutrition 110, 111, 111L, 116A, 116B, 190; and 114 or 117 or 118 20-22
Food Service Management 120, 120L, 121, 122, 123 14
Agricultural Economics 112 4

Breadth Subject Matter **17**
Principles of economics (Economics 1A) 5
Sociology or cultural anthropology 4
General psychology, Psychology 1 4
Principles of learning or methods of teaching (Applied Behavioral Sciences 173 or Education 110) 4

Unrestricted Electives **50-60**

Total Units for the Major **180**

Additional Specialization (Optional)
Students wishing to complete an additional specialization in Dietetics may elect one of the series of courses indicated below. Students are not required to elect any of these courses.

Clinical Dietetics specialization, include the following courses:
Biochemistry laboratory (Biochemistry 101L) 5
Chemistry, qualitative and quantitative analysis (Chemistry 1C, 5) 9
Human Anatomy (Medicine) 101 4
Community Nutrition specialization, include the following courses: Nutrition 116AL, 116BL, 118, 119 10
Anthropology 2 4
Sociology 3, 130, 143 12
Food Service Management specialization, include the following courses:
Agricultural Economics 155 4
Economics 1B, 11A-11B, and 150A 17

Major Adviser. F.J. Zeman *(Nutrition).*

Advising Center for the major is located in 109 Everson Hall (752-2512).

Graduate Study. See page 94.

Dramatic Art

(College of Letters and Science)

Robert A. Fahrner, Ph.D., Chairperson of the Department

Department Office, 222 Dramatic Art Building (752-0888)

Faculty
[4]Ruby Cohn, Ph.D., Professor *(Dramatic Art, Comparative Literature)*
Everard d'Harnoncourt, Ph.D., Professor
Robert A. Fahrner, Ph.D., Professor
Ralph Fetterly, M.A., Assistant Professor
Harry C. Johnson, M.A., Associate Professor
William E. Kleb, D.F.A., Associate Professor
Phyllis J. Kress, M.F.A., Adjunct Lecturer
Robert K. Sarlós, Ph.D., Professor
Theodore J. Shank, Ph.D., Professor
Daniel E. Snyder, Professor
Alan A. Stambusky, Ph.D., Professor
Darrell F. Winn, M.A., Adjunct Lecturer

The Major Program

Dramatic Art, with its classroom courses in each of the scholarly and artistic areas of the discipline, and with its University Theatre Season and its Premiere and Studio Seasons, 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.

Granada Artists-in-Residence Program. Each quarter a major British director joins the department to direct and teach directing.

Dramatic Art

A.B. Major Requirements:

UNITS

Preparatory Subject Matter **22**
Dramatic Art 20, 21A, 24, 25 14
Dramatic Art 21B or 27 3-4
Additional units to achieve a total of 22 lower division units in Dramatic Art 4-5

Depth Subject Matter **40**
Dramatic Art 124A, 124B, 127A, 127B or 160B, 156, 157, 158, 159, 160A 36
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.
A minimum of 4 elective units chosen from the following: Dramatic Art 115, 121A, 121B, 124C, 124D, 126, 150, 153, 155; or, with the adviser's consent, from appropriate literature courses in language and literature departments 4

Additional Requirements
During the undergraduate career majors are to participate in at least eight dramatic productions (exclusive of 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 **62**

Minor Program Requirements:

UNITS

Dramatic Art **20**
Dramatic Art 124A, 160A, 156, 157 or 158, 159 ... 20

Major Advisers. W.E. Kleb, 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. T. J. Shank. See page 98 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, play writing, or any combination of these), and Ph.D. (theatre research) degrees. Detailed information may be obtained by contacting the Graduate Adviser.

Graduate Adviser. E. d'Harnoncourt.

Lower Division Courses

10. Introduction to Acting (3) I, II, III. The Staff
Laboratory-discussion—4 hours. Fundamentals of movement, speech, theatre games, and improvisations. Selected reading and viewing of theatre productions intended for students not specializing in Dramatic Art.

15. The Art of the Cinema (4) I, III. d'Harnoncourt
Lecture—3 hours, laboratory—2 hours. The cinema as an art form, its relation to other arts, its evolution with emphasis on the significant modern contributions.

15L. Introduction to Filmmaking (2) I, III. d'Harnoncourt
Lecture-demonstration—1 hour; laboratory—3 hours. Prerequisite: course 15 concurrently or consent of instructor. Students in small groups will write, shoot, and edit 8 mm films, and prepare sound tracks for them.

20. Introduction to Dramatic Art (4) I, III. Kleb
Lecture—3 hours; discussion—1 hour. Understanding and appreciation of both the distinctive and collaborative contributions of playwright, actor, director, and designer to the total work of dramatic art. Study of plays from the major periods of dramatic art in their cultural contexts.

21A. Fundamentals of Acting (4) II. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 20. Physical and psychological resources of the actor. Experience in individual and group contact and communication, theatre games, advanced improvisation, sound and movement dynamics. Viewing of theatre productions. Limited to those planning to major in Dramatic Art.

21B. Fundamentals of Acting (4) III. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 21A and consent of instructor. Theory and practice of acting with emphasis on character analysis, interpretation, and development. Acting in a student-directed project. Viewing of theatre productions. Limited to those planning to major in Dramatic Art.

24. Visual Aspects of Dramatic Art (4) III. Snyder
Lecture—3 hours; laboratory—2 hours. Understanding and appreciation of the visual aspects of dramatic art: theatre architecture, scenery, lighting, costume, and makeup.

NOTE: For key to footnote symbols, see page 123.

25. Technical Aspects of Dramatic Art (2) I, Winn
Lecture—1 hour; laboratory—2 hours. Understanding and appreciation of the technical principles of dramatic production; basic tools and materials, principles of scene construction; scene painting, costume construction, stage rigging, lighting and sound equipment and control systems.

***27. Fundamentals of Playwriting and Directing** (3) III. Kleb
Discussion—2 hours; workshop—2 hours; reading of selected texts in the theory of directing and playwriting. Prerequisite: consent of instructor. Exercises in conceiving and developing theatre pieces with emphasis upon the creative collaboration of playwright and director.

28. Visual Arts and Theatre (4) I, Synder
Lecture-discussion—4 hours. The correlation between the visual arts and design for performance. Intended for students in the visual arts as well as for prospective majors.

30. Theatre Laboratory (1-5) I, II, III. The Staff
Prerequisite: course 25 or consent of instructor. Projects in acting, production, scene design, costuming, lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit up to a total of 8 units.

70. Theatre in Performance (4) III. Kleb
Lecture-seminar—4 hours. Theatre attendance and appreciation; traditional and experimental. Field trips, readings, discussions. Intended for students not specializing in Dramatic Art as well as for prospective majors. May be repeated once for credit.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Directed group study of a special topic. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

115. Advanced Study of Major Film Makers (4) II. d'Harnoncourt
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. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 21B and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources.

121B. Advanced Acting (4) II, Johnson
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 121A and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources.

124A. Principles of Theatrical Design: Scenery (4) I, Fetterly
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Scene design processes, working drawings, sketching techniques, scale models, methods and materials of scenery construction.

124B. Principles of Theatrical Design: Scenery (4) II. Snyder
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Analysis of plays in terms of scene design, elements of design, execution of designs for modern and period plays.

124C. Principles of Theatrical Design: Lighting (4) III. Winn
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Theories of lighting the stage, equipment and control systems, execution of lighting plots. Offered in even-numbered years.

124D. Principles of Theatrical Design: Costume (4) II. Kress
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Source materials for theatrical costuming, selecting fabrics, elements of design, analysis of plays in terms of costume design, execution of designs for modern and period plays. Offered in odd-numbered years.

126. Production Management (3) II. Winn
Lecture—3 hours. Prerequisite: course 25. Theoretical study of backstage operation from audition through performance: techniques of stage management, technical direction, cueing procedures and audience control. Offered in odd-numbered years.

127A. Principles of Directing (4) I, Stambusky
Lecture—2 hours; laboratory—4 hours; rehearsal. Prerequisite: courses 21A, 21B, or 27; 156, 157, 158, or consent of instructor. The director's creative approach to the play and to its staging.

127B. Principles of Directing (4) II. Stambusky
Lecture—2 hours; laboratory—4 hours; rehearsal. Prerequisite: course 127A and consent of instructor for non-majors. The director's creative approach to the actor.

150. American Theatre and Drama (4) II. Sarlós
Lecture—4 hours. The history of the theatre from Colonial times to the present. Readings of selected plays. Offered in odd-numbered years.

153. The American Musical (4) II. Kleb
Lecture—4 hours. History and development of the American Musical as a unique theatrical form. Offered in even-numbered years.

***155. Black Theatre and Drama** (4) III. Johnson
Lecture—4 hours. Black Theatre and drama today: the history, impact and current direction of the work of Blacks in the theatre. Offered in even-numbered years.

156. Theatre and Drama: Aeschylus to Machiavelli (4) I, Sarlós
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. Sarlós
Lecture—4 hours. Selected plays and the history of the theatre from the English Renaissance through German and French Romanticism.

158. Theatre and Drama: Ibsen to Albee (4) III. Fahrner
Lecture—4 hours. Selected plays and the history of the theater from English Romanticism to the present.

159. Contemporary Experimental Theatre and Drama (4) III. Shank
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.

180. Theatre Laboratory (1-5) I, II, III. The Staff
Prerequisite: upper division standing and course 25, or consent of instructor. Projects in acting, production, scene design, costuming lighting, directing, and playwriting. Participation in departmental productions. May be repeated for credit.

192. Internship in Dramatic Art (1-12) I, II, III. The Staff (Chairperson in charge)
Field work—3-36 hours. Prerequisite: upper division or graduate work in dramatic art; upper division course related to the project; consent of instructor and Department Chairperson. Internship outside the academic department enabling students to practice their skills. May be repeated for credit for a total of 12 units. (P/NP grading only.)

197T. Tutoring in Dramatic Art (1-4) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper division or graduate standing with major in dramatic art; consent of department chairperson. Leading of small voluntary groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5- I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200. Methods and Materials in Theatre Research (4) I, Sarlós
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. May be repeated for credit.

212. Advanced Stage Movement (2) II, III. The Staff
Laboratory—4 hours. Prerequisite: open to advanced undergraduates with consent of instructor. Rhythmic movement patterns relating to acting problems in classic and modern plays. May be repeated for credit.

221. Special Problems in Advanced Acting (4) I, II, III. Johnson
Seminar—2 hours; laboratory—4 hours. Prerequisite: consent of instructor. Advanced acting problems arising from differences in the type and style of plays selected from Greece to the present. May be repeated for credit.

224A. Visual Problems in Theatre and Performance (4) I, Snyder
Seminar—3 hours; term project. Special problems in visual and auditory aspects of theatrical production culminating in a single performance project. Open to Dramatic Art, Art, and Design majors. May be repeated for credit.

224B. Advanced Principles and Theories of Theatrical Design (4) II. Fetterly
Seminar—3 hours. Selected problems in the design of stage scenery and costumes; practice in design. May be repeated for credit.

224C. Advanced Principles and Theories of Theatrical Design (4) III. Snyder
Seminar—3 hours. Design of a production for three different types of theatres: open stage, arena, and proscenium. May be repeated for credit.

224D. Advanced Principles and Theories of Theatrical Costume Design (4) II. Kress
Seminar—3 hours; research and design projects—30 hours (minimum) total. Prerequisite: course 124D or consent of instructor. Costume design projects emphasizing research, principles, and theories; the planning and presentation of costume renderings, detail accessory sketches, and scale drawings of patterns. Projects from classic theatre, musical comedy, ballet, and opera. Offered in even-numbered years.

224E. Advanced Principles and Theories of Theatrical Lighting Design (4) III. Winn
Seminar—3 hours; laboratory—2 hours. Prerequisite: course 124C, a scenic design course, and consent of instructor. Design concepts, script/score analysis, color, composition and style. Projects presented in studio atmosphere. Also included: renderings, written analyses, and drafted plots. Offered in odd-numbered years.

227. Seminar in Directing Theory: Realism (4) I, Granada
Seminar—3 hours; term project. Modern directing theory as it applies to theatrical realism; development of directorial concepts for productions of selected realistic plays; emphasis on textual analysis. Offered in even-numbered years.

228. Seminar in Directing Theory: Non-Realism (4) I, Granada
Seminar—3 hours; term paper. Modern directing theory as it applies to non-realistic theatre; development of directorial concepts for production of selected non-realistic plays—Greek to the present; emphasis on textual analysis. Offered in odd-numbered years.

229. Special Problems in Directing (5) I, II, III. Granada
Seminar—2 hours; laboratory—2 hours; rehearsal—4 hours. Prerequisite: consent of instructor. Projects in directing scenes selected from plays from ancient Greece to the present. May be repeated for credit.

***230A-230B. Classic and Medieval Theatre** (4-4) II-III. Fahrner, Sarlós
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, Sarlós
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, Sarlós
Seminar—3 hours. The theatre of France, England, Germany, Italy, and America, 1660-1860; emphasis on relationship of dramas of the period to physical circumstances of production. Course 240A (may be taken separately) includes readings and discussion; 240B emphasizes research culminating in a scholarly paper. (Deferred grading only, pending completion of sequence, can be in effect.)

250. Modern Theatre (4) II. Sarlós
Seminar—3 hours. The theatre of Europe and America, 1860-1940, with emphasis on the relationship of the dramas of the period to the physical circumstances under which they were produced. Offered in even-numbered years.

***259. Contemporary Theatre** (4) I. Cohn
Seminar—3 hours: term paper. Selected aspects of contemporary Western theatre, with attention to their modes of production.

260. Advanced Playwriting (4) I, II, III. Shank
Seminar—3 hours. Dramatic structure, character, and dialogue. Advanced projects in playwriting. May be repeated for credit.

***265. Theory of Dramatic Art** (4) I, Kleb
Seminar—3 hours. Theory and aesthetic principles of dramatic art as a fine art. Offered in even-numbered years.

280. Theatre Laboratory (1-12) I, II, III. The Staff
Advanced practice in acting, designing, directing, playwriting, and technical theatre. May be repeated for credit.

NOTE: For key to footnote symbols, see page 123.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Individual Study (1-12) I, II, III, The Staff (Chairperson in charge)
(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

413. Stage Make-up (1) II. The Staff
Lecture-laboratory—2 hours. Prerequisite: consent of instructor. Lectures, demonstrations, and practical work in aspects of theatrical make-up.

Earth Sciences and Resources (A Graduate Group)

Kenneth L. Verosub, Ph.D.. Chairperson of the Group

Group Office, 175 Geology/Physics Building (752-6911/0350)

Faculty

The Group consists of forty-four faculty members from the Departments of Applied Science Engineering, Chemistry, Civil Engineering, Environmental Studies, Geography, Geology, Land, Air and Water Resources, Mechanical Engineering, and Physics.

Graduate Study. The Graduate Group in Earth Sciences and Resources offers M.S. and Ph.D. degrees for advanced training in a variety of interdisciplinary areas within the earth sciences. Among these areas are solid earth geophysics, geophysical fluid dynamics, climate dynamics, geological materials sci ence, nonrenewable resources, geochemistry and hydrogeology. The Group encourages applications from students with a strong background in the physical sciences but little previous background in the earth sciences.

Preparation. Applicants to the program are expected to have completed or to be in the process of completing an undergraduate degree in some aspect of the physical sciences, mathematics, or engineering. Undergraduate study must include one year of calculus, one year of physics with calculus, and one year of chemistry. Additional courses in advanced calculus and computer programming are recommended. Also, either before entering the program or during the first year of graduate study, students will be expected to acquire some familiarity with thermodynamics and continuum mechanics.

Core Curriculum. The core curriculum consists of the courses in Earth Sciences and Resources listed below. A master's degree candidate is required to take five of the courses, and a doctoral candidate is required to take all seven courses (although not necessarily within the first year). Students will be exempted from courses in which they have already had previous training.

Atmospheric processes: Atmospheric Science 200

Earth sciences and resources: Earth Sciences and Resources 201A, 201B

Solid-earth geophysics: Earth Sciences and Resources 240

Geochemistry: Geology 115

Physical and chemical oceanography: Environmental Studies 150A

Groundwater hydrology: Civil Engineering 142

Specialization. Each student will pursue an individual program of advanced study under the direction of a group of faculty members with similar interests but diverse backgrounds. Coursework in addition to the above is typically taken in the most appropriate graduate departments.

Graduate Advisers. K.L. Verosub *(Geology)*, T.M. Powell *(Environmental Studies)*, J.A. Cheney *(Civil Engineering)*.

Courses in Earth Sciences and Resources

Graduate Courses

201A. Earth Science and Resources (3) I. The Staff
Lecture—3 hours. Prerequisite: Physics 8C, Mathematics 21C, Chemistry 4C, or consent of instructor. Advanced survey of the earth's structure and processes. Earth's internal structure from geophysical evidence. Plate tectonics. Radiometric dating. Principles of mineralogy and petrology. Igneous and metamorphic processes. Erosion and weathering. Open to graduate students in Geology only with consent of instructor.

201B. Earth Science and Resources (3) II. The Staff
Lecture—3 hours. Prerequisite: course 201A and Mathematics 22C; or consent of instructor. Continuation of course 201A. Clastic and carbonate sediments; principles of stratigraphy; brittle and ductile deformation; faulting and folding; regional structure; energy resources; ore deposits; water resources; geologic engineering. Open to graduate students in Geology only with consent of instructor.

240. Geophysics of the Earth (3) II. McClain (Geology)
Lecture—3 hours. Prerequisite: course 201A, Physics 8C, Mathematics 22B; or consent of instructor. Physics of the earth's crust, mantle and core. Laplace's equation and spherical harmonic expression of gravity and magnetic fields. Elastic wave equation in geologic media. Body and surface seismic waves. Equations of state, thermal structure of the earth.

297. Seminar in Earth Sciences (3) III. The Staff
Seminar—3 hours. Prerequisite: graduate standing; consent of instructor. Seminar on current area of research in earth sciences and resources. Topic will change from year to year. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

East Asian Studies

(College of Letters and Science)

Donald Gibbs, Ph.D., Program Director

Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

Mary H. Fong, Ph.D. *(Art History)*
Donald Gibbs, Ph.D. *(Oriental Languages and Civilizations)*
Gary G. Hamilton, Ph.D. *(Sociology)*
Earl H. Kinmonth, Ph.D. *(History)*
Whalen W. Lai, Ph.D. *(Religious Studies)*
Kwang-Ching Liu, Ph.D. *(History)*
Don C. Price, Ph.D. *(History)*
Janet S. Shibamoto, Ph.D. *(Oriental Languages and Civilizations)*
[2,4]Marian B. Ury, Ph.D. *(Comparative Literature)*
Benjamin E. Wallacker, Ph.D. *(Oriental Languages and Civilizations)*

The Major Program

The East Asian Studies major is designed to give the student an understanding of East Asia (especially China and Japan) through interdisciplinary studies, combining sustained work in an oriental language with courses on East Asian countries. The program provides preparation either for a career that involves working with East Asian affairs and people (e.g., journalism, business, government service, teaching, and counseling), or as preparation for graduate studies in the East Asian field.

Students are required to develop a special field (e.g., anthropology, history, oriental languages) within the major, to be chosen in consultation with their adviser.

Since six quarters of language work are required, students normally should apply to this program in their sophomore year.

East Asian Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**42-48**
History 9A, 9B	8
One course from Art 1D, 20, Comparative Literature 53A, History 90A, 90B, Political Science 9, Religious Studies 4A, 70	3-4
Two years (or the equivalent) of Chinese or Japanese language study (Chinese 1-2-3-4-5-6; Japanese 1-2-3-4-5-6)	30
Depth Subject Matter	**36**
History 190B-190C or 194B-194C	8
Political Science 148A or 148B	4
Anthropology 190 or 191 or Sociology 147	4
At least 20 units from the following courses, as approved by the Committee in charge: Agricultural Economics 125; Anthropology 109, 110, 111, 112, 120, 122, 123, 124, 128, 135, 162, 190, 191; Art 163A, 163B, 164; Chinese 101, 111; Economics 115A, 115B, 116, 160A, 160B, 162, 171; Geography 127, 143; History 102G, 102H, 102N, 190A, 190B, 190C, 191A, 191B, 193, 194A, 194B, 194C, 194D, 195; Japanese 121; Oriental Languages and Civilizations 100; Political Science 127, 133, 138, 145, 148A, 148B; Religious Studies 172; Sociology 118, 141, 147, 170. (Other appropriate courses, including individual and group study courses (198, 199), as approved by the Committee in charge.)	20
Total Units for the Major	**78-84**

Recommended
Students are strongly urged to take a substantial number of courses in Euro-American civilization as a basis for comparison for a deeper understanding of America's relations with East Asia.

Minor Program Requirements:

Courses taken for the minor are expected to reflect a predominant interest in either China or Japan, but to provide some exposure to the other of the two countries. All courses counting towards the East Asian Studies major, including individual and group study courses (198, 199), may be used to fulfill the requirements for the minor program, as long as they deal predominantly with China, Japan, or both.

	UNITS
East Asian Studies	**22**
History 9B and 18 upper division units, of which at least 12 must be in courses focusing on China; OR History 9A and 18 upper division units, of which at least 12 must be in courses focusing on Japan	22

Major Advisers. China: D. Gibbs *(Oriental Languages and Civilizations)*. D.C. Price *(History)*; Japan: Janet Shibamoto *(Oriental Languages and Civilizations)*.

Courses in East Asian Studies. The following courses count toward the major and are open to students throughout the campus. Refer to departmental listings for course descriptions.

Anthropology
190. Cultures of China and Korea
191. Culture of Japan

Art
1D. Asian Art
20. Myths and Symbols in Chinese Art
163A. Chinese Art
163B. Chinese Painting
164. The Arts of Japan

NOTE: For key to footnote symbols, see page 123.

Chinese
1-2-3. Elementary Modern Chinese
4,5,6. Intermediate Modern Chinese
101. Classical Chinese
111. Modern Chinese Literature: Reading and Discussion

Comparative Literature
53A. Literature of China and Japan

Economics
171. Economy of East Asia

Geography
127. Geography of Contemporary China

History
9A. History of East Asian Civilization (China)
9B. History of East Asian Civilization (Japan)
90A. Modernization of China
90B. Modernization of Japan
102G. Undergraduate Proseminar: China to 1800
102H. Undergraduate Proseminar: China since 1800
102N. Undergraduate Proseminar: Japan
190A, 190B. Late Imperial China: Background to Revolution
190C. The Chinese Revolution
191A. Classical China
191B. High Imperial China
193. History of the People's Republic of China, 1949 to the Present
194A. Aristocratic and Feudal Japan
194B. Early Modern Japan
194C. Modern Japan
194D. Business and Labor in Modern Japan
194E. Education and Technology in Modern Japan
195. Modern China and the West

Japanese
1-2-3. Elementary Modern Japanese
4-5-6. Intermediate Modern Japanese
101. Literary-Style Japanese
111. Japanese Composition
121-122-123. Modern Japanese: Reading and Discussion

Oriental Languages and Civilizations
100. Languages of Eastern Asia

Political Science
133. The American Role in East Asia
138. International Relations: East Asia
148A, 148B. Government and Politics in East Asia

Religious Studies
70. Introduction to Buddhism
172. Ch'an (Zen) Buddhism

Sociology
147. Sociological Perspectives on East Asia

Courses in East Asian Studies

Lower Division Courses

1. Modern Chinese Literature (in English) (3) II. Gibbs
Lecture—3 hours. Introductory course requiring no knowledge of Chinese language or history. Reading and discussion of short stories and two novels. Designed to convey a feeling for what China has experienced in the twentieth century.

***9. Korean Civilization: Tradition and Transformation** (4) III. Kim
Lecture—3 hours; term paper. Survey of traditional Korean civilization and its modern transformation, with emphasis on thought, religion, political and social life, art, and literature, and providing perspectives on contemporary Korea.

Upper Division Course

***150. The East Asian World Order: Its Evolution and Transformation** (4) II. Kim
Lecture—3 hours; term paper. Prerequisite: History 9A and/or 9B recommended. Survey of diplomacy, trade, and wars in East Asia from early times, including an analysis of the region's premodern system of interstate relations, and a history of relations among China, Japan, Korea, and Vietnam in modern times.

Ecology (A Graduate Group)

R. Merton Love, Ph.D., Chairperson of the Group (752-6751)

Group Office, 2146 Wickson Hall (752-6752)

Faculty. The Group includes faculty from 45 departments in five schools and colleges.

Graduate Study. The Graduate Group in Ecology offers the M.S. and Ph.D. degrees in three broad study options: (1) biological, (2) human, and (3) physical and chemical ecology. Several areas of specialization are possible in each of the three. Details of the program may be obtained from the Chairperson of the Group.

Preparation. Appropriate preparation is undergraduate work in 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 (organic chemistry strongly recommended), in elementary physics; a course in statistics; calculus and computer programming or other suitable mathematical training; and a course in ecology. Applicants to the (2) human ecology area will normally be expected to have completed a one-year sequence in basic biology; a course in evolution or genetics; two courses in chemistry; one course in physics; one course in calculus, one in statistics; and a course in ecology. Each of the three broad areas requires certain advanced preparation appropriate to the area.

Breadth Requirement. All degree candidates are required to select an upper division course from each of the following three study options. 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/Anthropology 101 (principles of human ecology), Environmental Studies/Anthropology 141 (cultural ecology), or Geography 170 (cultural ecology).
c. Physical and Chemical Ecology courses: Environmental Studies 151-151L (limnology), Environmental Studies/Geology 150A (physical and chemical oceanography), Atmospheric Science 133 (biometeorology), or Wildlife and Fisheries Biology 153 (Wildlife in Polluted Environments).

Graduate Adviser. R.M. Love.

Related Courses. Many departments offer such courses. A list of these courses is available at the Group Office.

Courses in Ecology

Graduate Courses

201A-201B. Advanced Biological Ecology (4-4) I-II. Pearcy (Botany), Salt (Zoology), Schoener (Zoology) in charge 201A, Toft (Zoology) in charge 210B, Watt (Zoology), Weathers (Avian Sciences)
Lecture—3 hours; discussion—1 hour. Prerequisite: Zoology 125 or an equivalent advanced undergraduate course in ecology. Examination of major conceptual issues motivating current ecological research.

210. Advanced Topics in Human Ecology (4) III. Orlove (Environmental Studies)
Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing. Course stresses the commonalities that human ecologists have as social scientists who specialize in problems relating human populations and environmental variables. General epistemological issues and theoretical models are reviewed. Similarities and differences of human and biological ecology are examined. Offered in odd-numbered years.

211. Advanced Topics in Cultural Ecology (3) I, Orlove (Environmental Studies)
Lecture—3 hours. Prerequisite: graduate standing. Discussion and evaluation of theories which relate environment, culture and social structure. The works of several major theorists will be examined with regard to analytical models, empirical data, research methodologies, and modes of explanation. Offered in even-numbered years. (Same course as Anthropology 211.)

212A. Environmental Policy Analysis (4) III. Sabatier (Environmental Studies)
Lecture—3 hours; discussion—1 hour; seminar paper. Prerequisite: course in public policy (e.g. Political Science 107 or 108), course in bureaucratic policy making (e.g., Environmental Studies 166 or Political Science 181), course in intermediate statistics (e.g., Sociology 106 or Agricultural Economics 106.) An examination of selected topics in the formulation and implementation of environmental policy, with a principal emphasis on conceptual and methodological issues. Offered in odd-numbered years. (Same course as Environmental Studies 212A.)

212B. Environmental Policy Analysis: Evaluation (4) I, Schwartz, Cramer, and Wilen (Environmental Studies)
Lecture—1 hour; discussion—1 hour; seminar—2 hours; independent evaluation project. Prerequisite: Economics 100 or the equivalent, Environmental Studies 168A (or the equivalent course in policy analysis or resource economics); intermediate level statistics (e.g., Sociology 106 or Agricultural Economics 106). Examination of recent research and practice in the evaluation of environmentally related policies, programs and plans. Ex-ante and ex-post evaluation will be studied. Offered in odd-numbered years. (Same course as Environmental Studies 212B.)

213. Advanced Demography (4) III. Cramer (Sociology)
Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 178, Sociology 170, and Ecology 210, or consent of instructor; graduate standing. An analysis of the social and economic determinants of mortality, fertility, and population size; of selected consequences of demographic trends; and of how demography is related to human ecology. Special emphasis on methods of analysis and on contemporary societies. Offered in even-numbered years.

221. Chemical Aspects of Ecology (3) I, Crosby (Environmental Toxicology)
Lecture—3 hours. Prerequisite: Chemistry 1A-1B-1C and 8B or 128C (or the equivalent); a course in biological ecology; graduate standing, and consent of instructor. A week will be spent on each of nine subjects including chemical ecology of reproduction, nutrition, defense, communication, adaptation, and ecosystem structure and function. Offered in odd-numbered years.

230. Analysis of a Selected Ecosystem (4) III. Whittig (Land, Air and Water Resources), Van Riper (Zoology)
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 (Yosemite National Park). Recent advances in theory, technique, and basic information are emphasized. Lectures will be given by specialists from several fields. May be repeated for credit.

231. Models in Ecological Research (4) I, Foin (Environmental Studies)
Lecture—2 hours; discussion—1 hour; laboratory—2 hours. Prerequisite: graduate student standing; one course each in calculus and statistics and Environmental Studies 128; a course in ecology recommended. Evaluation of the role of models in ecological research. May be repeated for credit through course 298 (with S/U grading only). Offered in odd-numbered years.

232. Theoretical Ecology (3) III. Hastings
Lecture—3 hours. Prerequisite: courses 201A-201B and Mathematics 22A-22B; or Environmental Studies 100, 128 or Zoology 125, and Mathematics 118B and 119. Examination of major conceptual and methodological issues in theoretical ecology. Model formulation and developemnt will be emphasized. Topics will vary from year to year. May be repeated for credit. Offered in even-numbered years.

290. Seminar in Ecology (1-3) I, II, III. The Staff (Chairperson in charge)
Seminar—1-3 hours. Prerequisite: consent of instructor. Topics in biological, human, physical, and chemical ecology. Students are expected to present an oral seminar on a particular aspect of the general topics under consideration. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing and consent of instructor. Perception, definition, and attack on a selected ecological problem, drawing on the expertise of faculty from different departments in the Graduate Group in Ecology. (Sec. 1, letter grading; all other sections, S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

Economics

(College of Letters and Science)

Steven M. Sheffrin, Ph.D., Chairperson of the Department

Department Office, 380 Kerr Hall (752-0741)

Faculty

Moshe Adler, Ph.D., Assistant Professor
Andrzej Brzeski, Ph.D., Professor
Mark Dynarski, Ph.D., Assistant Professor
Bruce Glassburner, Ph.D., Professor Emeritus
W. Eric Gustafson, Ph.D., Senior Lecturer
[1]Timothy D. Hau, Ph.D., Assistant Professor
L. Jay Helms, Ph.D., Assistant Professor
Hiromitsu Kaneda, Ph.D., Professor
Elsie M. Knoer, Ph.D., Assistant Professor
Peter H. Lindert, Ph.D., Professor
Thomas Mayer, Ph.D., Professor
Martin P. Oettinger, Ph.D., Senior Lecturer
Alan L. Olmstead, Ph.D., Professor
[4]John E. Roemer, Ph.D., Professor
Steven M. Sheffrin, Ph.D., Associate Professor
[2]T. Y. Shen, Ph.D., Professor
[2]Joaquim Silvestre, Ph.D., Professor
Arthur M. Sullivan, Ph.D., Assistant Professor *(Economics, Administration)*
Elias H. Tuma, Ph.D., Professor
Gary M. Walton, Ph.D., Professor *(Economics, Administration)*
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	**16-19**
Economics 1A-1B	10
Economics 12, Statistics 13, 32, or 102	3–5
(At least a C average in the above courses.)	
Mathematics 16A or 21A	3-4
Depth Subject Matter	**40**
Economics 100 or 100M; 101	10
One course from 110A, 110B, 111A, 111B	4
One course sequence from Economics 110A-110B; 111A-111B; 115A-115B; 116-117; 121A-121B; 125A-125B; 130-131; 136A-136B; 150A-150B; 151A-151B; 150A-151A; 160A-160B	8-10
Additional economics courses to achieve a minimum of 40 upper division units (A minimum of 36 upper division units required for students who declared an Economics major prior to Fall Quarter 1982.)	16-18
Total Units for the Major	**56–59**

Recommended

Students considering graduate study in economics or business administration are strongly urged to take Mathematics 16B in addition to 16A.

It is highly recommended, but not required, that students take Economics 100 prior to 101; and the Department also suggests that these courses be taken as soon as possible after the introductory course. Except under extraordinary circumstances, not more than three economics courses may be taken in any one quarter. In special cases, the department will accept a limited number of related upper division courses from other departments in satisfaction of the economics upper division course requirements. Approval from a departmental adviser is required in all such cases.

Graduation with Highest Honors. To graduate with Highest Honors in Economics, a student must earn in all upper division economics classes a grade-point average equal to that required by the College in all University of California work.

Major Advisers. M. Adler, A. Brzeski, E. Gustafson, T. D. Hau, E.M. Knoer, L. Shaffer, M.P. Oettinger, P.H. Lindert.

American History and Institutions. This University requirement can be satisfied by completion of Economics 111A, 111B. (See also page 61.)

Teaching Credential Subject Representative. A. Brzeski. See page 98 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 *Graduate Announcement* and contact the chairperson of the departmental graduate committee.

Graduate Advisers. L.J. Helms, H. Kaneda, T. Mayer, J.E. Roemer, T.Y. Shen, L.L. Wegge.

Courses in Economics

Lower Division Courses

1A. Principles of Microeconomics (5) I, II, III. The Staff
Lecture—3 hours; discussion—2 hours. Courses 1A and 1B may be taken in either order. Analysis of the allocation of resources and the distribution of income through a price system; competition and monopoly; the role of public policy; comparative economic systems.

1B. Principles of Macroeconomics (5) I, II, III. The Staff
Lecture—3 hours; discussion—2 hours. Courses 1A and 1B may be taken in either order. Analysis of the economy as a whole; determinants of the level of income, employment, and prices; money and banking, economic fluctuations, international trade, economic development; the role of public policy.

11A. Elementary Accounting (4) I, Oettinger
Lecture—3 hours; laboratory—2 hours. The history and basic concepts of accounting; the ledger, journals, income statement, and the balance sheet; inventory valuation; depreciation; introduction to cost accounting; analysis of financial statements; social accounting. (Deferred grading only, pending completion of 11A-11B sequence.)

11B. Elementary Accounting (4) II. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 11A. Continuation of course 11A. (Deferred grading only, pending completion of 11A-11B sequence.)

***12. Introduction to Quantitative Methods in Economics** (5) I,———; III, Gustafson
Lecture—4 hours; laboratory—2 hours. Prerequisite: two years of high school algebra. Methods of analyzing quantitative economic data including descriptive statistics; sampling and statistical inference index numbers, correlation, and time series. Emphasis on the logic of procedures, interpretation, and application. Not open to students having credit for Statistics 13, or Sociology 46A-46B.

***49. Lower Division Seminar** (1-3) I, II, III, The Staff (Chairperson in charge)
Seminar—1-3 hours. Prerequisite: lower division standing and consent of instructor. (P/NP grading only.)

92. Internship and Field Work (1-12) I, II, III. Oettinger
Laboratory—3-36 hours; term paper. Prerequisite: junior or senior standing; availability of internship position or approved field work project; stock-brokerage interns must have completed course 11A-11B; consent of instructor. Intensive study of practical application of concepts in economics, stressing research methods and empirical analysis. (P/NP grading only.)

98. Group Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Individual Study for Undergraduates (1-5) I, II, III, The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Intermediate Micro Theory (5) I, II, III. The Staff (Chairperson in charge)
Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B, and either Mathematics 16A or 21A or consent of instructor. Price and distribution theory under conditions of perfect and imperfect competition; welfare economics. Not open to students who have received credit for course 100M or Agricultural Economics 100A or 100B.

100M. Intermediate Micro Theory (5) II. The Staff (Chairperson in charge)
Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B; Mathematics 16A, 16B. Price and distribution theory under conditions of perfect and imperfect competition. Welfare economics. Extensive use of algebra and the calculus. Not open to students who have completed course 100. Agricultural Economics 100A or 100B.

101. Intermediate Macro Theory (5) I, II, III. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Theory of income, employment and prices under static and dynamic conditions.

***105. History of Economic Thought** (4) III. The Staff
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Historical survey of economic doctrine: the Classical School and its antecedents. Neoclassical thought, criticism of classical thought, emergence of modern economic thought.

110A. Economic History (4) I. Tuma
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of economic change in Europe prior to the year 1700; reference to other regions of the Eastern Hemisphere; implications for contemporary economic development.

110B. Economic History (4) I, Tuma
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of economic change in Europe from the year 1700 to the present; reference to other regions of the Eastern Hemisphere; implications for contemporary economic development.

111A. Economic History (4) II. Olmstead
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of economic change in the United States from Colonial times to 1865; reference to other regions in the Western Hemisphere.

111B. Economic History (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, or consent of instructor. Survey of economic change in the United States from 1865 to the post World War II era.

115A-115B. Economic Development (4-4) I, II-III. The Staff
Lecture—3 hours; discussion—1 hour to be arranged. Prerequisite: courses 1A-1B or consent of instructor. Theories of economic development and underdevelopment, economic policy for growth and development. Contemporary and historical case studies.

116. Economic Systems (4) II. Brzeski
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Critical examination of major economic systems; their goals and institutions; capitalism, fascism, and varieties of socialism; problems of economic planning in USSR, India, China, and other industrializing economies.

117. The Soviet Economy (4) III. Brzeski
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Survey of Soviet economic development: economic organization, methods of planning, and performance.

***118. Political Economy of Agrarian Reform** (4) II. Tuma
Lecture—3 hours; discussion—1 hour to be arranged. Prerequisite: courses 1A-1B or the equivalent. Theory and concepts of reform; illustrations from various periods and regions. Impact on economic development; problems of change and stability. Relationship to economic, social, and political institutions.

119. Marxian Economics (4) I, Adler
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 100 (or 100M). Marxian economic theories, including theories of value, surplus value and exploitation; accu-

NOTE: For key to footnote symbols, see page 123.

mulation, the business cycle and crises; the role of the State and its relation to classes; imperialism. Writings of Marx and economists in the Marxian tradition will be studied.

121A. Industrial Organization (4) II. Shen
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 100 (or 100M), or consent of instructor. An appraisal of the role of competition and monopoly in the American economy; market structure, conduct, and economic performance of a variety of industries.

121B. Industrial Organization (4) III. Adler
Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 121A. Public policy in a private enterprise economy; antitrust and other policies toward industry; economies of regulated industries.

123. Ecology and Economics (4) I, Gustafson
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Economies and populations as self-regulating systems; economic regulation of man's interaction with its environment. Topics: population growth and its economic determinants; optimal rates of use of exhaustible and renewable resources; implications of common property in resources; prospects for agricultural growth.

125A-125B. Urban Economics (4-4) I-II. Sullivan, Dynarski
Lecture—3 hours; to be arranged—1 hour. Prerequisite: courses 1A-1B, 100 (or 100M), or consent of instructor. Analysis of the structure and growth of the urban economy. Topics include: land use, residential and business growth, housing markets, transportation; metropolitan fiscal problems; urban decay and renewal, poverty, discrimination; public policy.

130. Public Microeconomics (4) II. Hau
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 100M, or consent of instructor. Public expenditures; theory and applications. Efficiency and equity of competitive markets; externalities, public goods, and market failures; positive and normative aspects of public policy for expenditure, including benefit-cost analysis. Topics include consumer protection, pollution, education, poverty and crime.

131. Public Finance (4) III. Helms
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 100M, or consent of instructor; course 101 recommended. Financing government expenditures. Efficiency and equity aspects of taxes, including personal income tax, property tax, and sales tax; tax loopholes and tax reform; revenue sharing; macroeconomic effects of taxation *vs.* debt financing.

134. Corporation Finance (4)I, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 11A, 12 and Mathematics 16A. General background and rationale of corporation; finance as resource allocation over time; decision making under uncertainty and the role of information; capital market and interest rate structure; financial decisions. Students who have completed Agricultural Economics 171A may not receive credit for this course.

135. Money, Banks and Financial Institutions (3)I, III. Mayer
Lecture—3 hours. Prerequisite: courses 1A-1B or consent of instructor. Monetary institutions, the banking system, money creation, the Federal Reserve System, the tools of monetary policy.

136A. Monetary Theory (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Monetary theory; the impact of changes in the quantity of money and of liquid assets on money income.

136B. Monetary Policy (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 135 and 136A. Evaluation of monetary policy, its impact on the economy and past performance, the problem of inflation.

140. Introduction to Econometrics (4) II, III. Helms
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 12 or the equivalent; 100 or 100M, 101; Mathematics 16A-16B or 21A. Introduction of problems of observation, estimation and hypothesis testing in economics through the study of the theory and application of linear regression models, critical evaluation of selected examples of empirical research and exercises in applied economics.

***150A. Economics of Trade Unionism** (4) II. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A-1B. Theory and philosophy of labor movements in America. Western Europe and the developing world; the history, structure and government of American Trade unions; theory and practice of collective bargaining. Offered in even-numbered years.

***150B. Labor and Public Policy** (4) III. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A or consent of instructor. The economic impact of labor legislation; industrial disputes, their settlement and government intervention; unions and the anti-trust laws; the union interest in welfare programs. Offered in even-numbered years.

***151A. Economics of the Labor Market** (4) II. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or 100M. Theory of labor supply and demand; determination of wages and employment in the labor market. Economic theories of labor unions. Policy issues; labor force participation by married women; minimum wages and youth unemployment; effect of unions on wages. Offered in odd-numbered years.

***151B. Economics of Human Resources** (4) III. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 151A. Human resource analysis; introduction to human capital theory and economics of education; the basic theory of wage differentials, including theories of labor market discrimination; income distribution; poverty. Policy issues; negative income tax; manpower training programs; incomes policy. Offered in odd-numbered years.

160A. International Microeconomics (4) I, Kaneda
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B, 100 or 100M, or consent of instructor. Students who have completed course 162 may receive only 2 units of credit for course 160A. International trade theory: impact of trade on the domestic and world economies; public policy toward external trade.

160B. International Macroeconomics (4) II. Lindert
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B, 100 or 100M, and 101, or consent of instructor. Macroeconomic theory of an open economy. Balance of payments adjustment mechanism, international monetary economics issues; international financial institutions and their policies. Students who have completed course 162 may receive only 2 units of credit for course 160B.

162. International Economic Relations (4) I, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. International trade and monetary relations, trade policy, exchange rate policy, policies toward international capital migration and investment. Emphasis on current policy issues. Course intended especially for non-majors. Students who have completed course 160A or 160B may not receive credit for this course.

***170. Economy of the Middle East** (4) I, II, III. Tuma
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of the Middle East. Consult department for course scheduling.

***171. Economy of East Asia** (4) I. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of East Asia. Consult department for course scheduling.

***172. Economy of South Asia** (4) III. Gustafson
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of South Asia. Consult department for course scheduling.

***173. Economy of South-East Asia** (4) III. Glassburner
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of South East Asia. Consult department for course scheduling.

***174. Economy of Europe** (4) III. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of Europe. Consult department for course scheduling.

***175. Economy of Sub-Sahara Africa** (4) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of the Sub-Sahara. Consult department for course scheduling.

190. Topics in Economics (4) I. The Staff
Lecture-discussion-seminar—4 hours. Prerequisite: consent of instructor. Selected topics in economic analysis and public policy. Variable content. May be repeated for credit.

194HA-194HB-194HC. Special Study for Honors Students (3-2-2) I-II-III. The Staff (Gustafson in charge)
Seminar. Prerequisite: major in Economics with senior standing; consent of instructor. A program of research culminating in the writing of a senior honors thesis under the direction of a faculty adviser. (Deferred grading only, pending completion of course.)

197T. Tutoring in Economics (1-5) I, II, III. The Staff (Chairperson in charge)
Undergraduate tutors will lead small voluntary discussion groups affiliated with one of the department's regular courses, under the supervision of, and at the option of the instructor in charge of the course. Units may not be counted toward satisfaction of major requirements. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A. Microeconomic Theory (5) II. The Staff (Chairperson in charge)
Lecture—4 hours; discussion—1 hour. Prerequisite: Economics/Agricultural Economics 200M, Mathematics 16A-16B, or consent of instructor. Theories of the behavior of individual economic agents. Characteristics of market equilibrium in perfectly competitive, monopolistic, and monopsonistic markets. (Same course as Agricultural Economics 200A.)

200B. Microeconomic Theory (5) III. Helms
Lecture—4 hours; discussion—1 hour. Prerequisite: course 200A or consent of instructor. Introduction to theorems of welfare economics in a general equilibrium, linear economic models, externalities and market failure, social welfare functions. (Same course as Agricultural Economics 200B.)

200C. Microeconomic Theory (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A, 200B. Further topics in microeconomics, including risk and uncertainty, capital theory, separability and aggregation, and other topics. (Same course as Agricultural Economics 200C.)

200D. Macroeconomic Theory (4) II. Sheffrin
Lecture—3 hours. Macro static theory of income, employment, and prices.

200E. Macroeconomic Theory (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 200B and 200D; Mathematics 16A-16B; or consent of instructor. Macrodynamic theory of income, employment, and prices.

200M. Optimization in Economics (5) I, Roemer
Lecture—4 hours; discussion—1 hour. Prerequisite: courses 100 or 100M, 101; Mathematics 21A-21B. Techniques of optimization for economic analysis: linear algebra, applications to systems of linear equations; multivariate analysis; linear and nonlinear programming, Kuhn-Tucker Theorem. (Same course as Agricultural Economics 200M.)

201A. History of Economic Thought (4) III. Shen
Lecture—3 hours; discussion—1 hour. Economic thought from the classical Greece era to Modern Times.

***201B. History of Economic Thought II** (4) I, Shen
Lecture—3 hours; discussion—1 hour. Origins and emergence of modern economic analysis. Offered in even-numbered years.

202. Topics in Economic Theory (4) II. Roemer
Seminar—4 hours. Prerequisite: courses 200A through 200E or consent of instructor. Recent developments in economic theory.

203A. Advanced Economic Theory (4) II. Silvestre
Seminar—4 hours. Prerequisite: course 200C. Advanced topics in the theory of the firm, distribution theory; welfare economics.

203B. Advanced Economic Theory (4) III. Knoer
Seminar—4 hours. Prerequisite: courses 200C and 200E. General equilibrium theory; capital theory; growth theory.

204. Microeconomic Analysis (5) I, Dynarski
Lecture—4 hours; discussion—1 hour. Prerequisite: course 100 (or 100M) or Agricultural Economics 100A, 100B and Mathematics 16A, 16B. Open to advanced undergraduates with consent of instructor. Economic reasoning and social choice: behavior of firms and households, theory of markets, partial and general equilibrium analysis, welfare economics, illustrations and applications. (Same course as Agricultural Economics 204.)

205. Macroeconomic Analysis (5) II. The Staff
Lecture—4 hours; discussion—1 hour. Prerequisite: course 101, Mathematics 16A, 16B, or the equivalent. Income, employment and the price level, money, income distribution, capital theory, growth theory, government policies, empirical models and methods.

207. Special Topics in Mathematical Economics (4) III. Silvestre
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

NOTE: For key to footnote symbols, see page 123.

economic phenomena drawn from the history of different countries.

210B. Economic History (4) III. Lindert
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) II. 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) I, II. Tuma
Seminar—4 hours. Prerequisite: a graduate course in economic history. Selected topics and issues, emphasis on current research.

215A. Economic Development (4) I, Kaneda
Seminar—3 hours; discussion—1 hour. Prerequisite: bachelor's degree in Economics or the equivalent, or consent of instructor. Theories of economic development as they relate to developing nations; demographic problems; distribution issues in economic development. (Same course as Agricultural Economics 215A.)

215B. Macroeconomic Development (4) II. Kaneda
Seminar—3 hours; discussion—1 hour. Prerequisite: course 215A. The macroeconomics of economic development; monetary policy problems; fiscal problems, international trade; specific country studies. (Same course as Agricultural Economics 215B.)

215C. Economic Development in Agriculture: Policy and Planning (4) III. Hansen (Agricultural Economics)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 215A or the equivalent. Agriculture in the structure of developing nations; its role in economic development; agriculture and national planning; sectoral policies relating to prices, inputs, productivity, and marketing; international aspects of trade, aid, and technical assistance; country case studies. (Same course as Agricultural Economics 215C.)

215D. Development Programming (4) III. The Staff
Seminar—3 hours; discussion—1 hour. Prerequisite: courses 215A, 215B or 215C, 200B, 200E. Analysis of development plans, programs and policies. Application of input-output, programming, and operations research. Techniques of project evaluation. (Same course as Agricultural Economics 215D.)

216. Economic Systems (4) II. Brzeski
Lecture—4 hours. Comparative study of economic systems, with reference to their organization and institutions, their values and goals, and their economic performance.

217. Economics of Planning (4) III. Brzeski
Lecture—4 hours. Theories and principles of economic planning under various economic systems.

***219. Marxian Economic Theory** (4) I, Roemer
Lecture—4 hours. Prerequisite: Mathematics 16A-16B, linear algebra, or course 200M. Marx's dialectical approach to economics; labor theory of value and exploitation; the transformation problem: schemes of production and reproduction; capital accumulation; falling rate of profit; theories of immiseration, crisis and growth; labor process under capitalism.

221A. Industrial Organization (4) I, II. Shen
Lecture—3 hours; to be arranged—1 hour. Analysis of market structure, business behavior, and economic performance under conditions of limited governmental interference.

221B. Industrial Organization (4) I, Adler
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. The Staff
Lecture—2 hours; seminar—2 hours. Prerequisite: one year of law school; course 200A or consent of instructor. Studies the effects of legal rules on resource allocation and applies economic analysis to explicate problems in torts, property, and contracts.

225A. Urban Economics (4) I, Dynarski
Lecture—2 hours; discussion—2 hours. Prerequisite: course 200A or 204. Application of economic theory and quantitative methods to the urban economy: location, structure and growth.

225B. Urban Economics (4) II. Dynarski
Lecture—2 hours; discussion—2 hours. Prerequisite: course 225A. Urban problems and urban public economics; housing, transportation, discrimination, local public goods and urban fiscal problems.

230A. Public Finance (4) II. Helms
Lecture—2 hours; seminar—2 hours. Welfare economics, externalities, public and merit goods, local public goods, transactions costs and market failure, benefit-cost analysis, politics of collective choice, topics (e.g., economics of education, transfers in income and in-kind, consumer protection, pollution, transportation and congestion).

230B. Public Finance (4) III. Hau
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. Oettinger
Lecture—4 hours; term paper. Prerequisite: Statistics 130B and course in linear algebra. Statistical models and their use in estimation of economic relationships; single and multiple equation systems. (Same course as Agricultural Economics 240A.)

***240B. Advanced Econometrics: Theory** (4) I, Wegge
Lecture—3 hours; discussion—1 hour. Prerequisite: course 240A; Statistics 131A, 131B-131C recommended. Multivariate analysis, specification analysis, simultaneous equation models, identification, estimating methods, small sample properties. (Same course as Agricultural Economics 240B.)

240C. Advanced Econometrics: Applications (4) II. Wegge
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 Agricultural Economics 240C.)

***250A. Labor Economics** (4) III. Oettinger
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 150A-150B or the equivalent. Philosophy, theory and history of American and foreign labor movements; union structure, organization and collective bargaining under changing labor market conditions; current labor market issues.

***250B. Labor Economics** (4) II. Shaffer
Lecture—3 hours; discussion—1 hour. Prerequisite: course 151A or consent of instructor; course 204 or 200A recommended. Microeconomic theory of labor supply and labor demand, estimation of labor supply and demand functions; human capital theory; labor market analysis.

260A. International Economics (4) I, Wegge
Lecture—3 hours discussion—1 hour. Theory of trade determinants; gains from trade; tariffs and effective protection; economic unions.

260B. International Economics (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Balance of payments adjustment mechanisms; foreign exchange markets; theories of balance of payments policy and international monetary mechanisms.

260C. International Economics (4) III. Wegge
Seminar—4 hours. Prerequisite: courses 200C, 200E, 240A, and 260A. Survey of current literature in International Trade theory.

280. Orientation to Economic Research (2) III. Mayer.
Discussion—2 hours. Course tries to bridge the gap between students' classwork and their subsequent research. It deals with topics such as the origination of a research project, some mechanics of empirical research and hints on the submission of research papers. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Discussion—1-5 hours. Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor and graduate standing. (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (S/U grading only.)

Professional Course

397. Teaching of Economics (2) I, II, III. The Staff (———in charge)
Lecture-discussion—2 hours. Prerequisite: graduate standing in economics. Teaching of economics: methods of instruction, organization of courses, examination and evaluation procedures. (S/U grading only.)

Education

(College of Letters and Science)

Julius M. Sassenrath, Ph.D., Chairperson of the Department
David R. Wampler, Ph.D., Head of Teacher Education

Department Office, 180 Kerr Hall
Student Advising, 174 Kerr Hall (752-0757)

Faculty

Donald G. Arnstine, Ph.D., Professor
Helen G. Bacon, Ed.D., Lecturer in and Supervisor of Teacher Education
Hugh C. Black, Ph.D., Professor
Vincent A. Crockenberg, Ph.D., Associate Professor
W. Augustus Davis, Ph.D., Lecturer in and Supervisor of Teacher Education
Linnea C. Ehri, Ph.D., Professor
[4]Richard A. Figueroa, Ph.D., Associate Professor
Kathleen M. Fisher, Ph.D., Associate Professor *(Education, Biological Sciences)*
Maryann Gatheral, B.A., Lecturer in and Supervisor of Teacher Education
Jack E. Lowry, M.A.T., Lecturer in and Supervisor of Teacher Education
Barbara J. Merino, Ph.D., Assistant Professor
Douglas L. Minnis, Ed.D., Senior Lecturer
Susan A. Ostergard, Ed.D., Lecturer in and Supervisor of Teacher Education
Victor A. Perkes, Ed.D., Lecturer in and Supervisor of Teacher Education
Jonathan H. Sandoval, Ph.D., Professor
Julius M. Sassenrath, Ph.D., Professor
S. Joan Skinner, M.A., Lecturer in and Supervisor of Teacher Education
Carlton J. Spring, Jr., Ph.D., Professor
Leroy F. Troutner, Ph.D., Associate Professor
David R. Wampler, Ph.D., Lecturer in and Supervisor of Teacher Education
George D. Yonge, Ph.D., Professor

Teacher Education Curricula

For a statement of complete requirements and appointments with credential advisers, contact the departmental Student Advising Office, 174 Kerr Hall. Interested students are urged to do this *as early as possible* in their academic career.

Applicants to the basic (multiple subject or single subject) credential programs should contact the Student Advising Office for forms and procedural information early in the fall quarter of their senior year.

Credential Counselors: Multiple Subject. H. G. Bacon, M. Gatheral, S. A. Ostergard, S. J. Skinner, D. R. Wampler.

Bilingual Emphasis. B. J. Merino.

Credential Counselors: Single Subject. W. A. Davis, J. E. Lowry, V. A. Perkes.

(The Department of Education does not offer an undergraduate major program. However, it does offer a minor.)

Graduate Study. The Department offers programs of study and research leading to the M.A. degree in Education. Detailed information regarding graduate study may be obtained by writing the Graduate Adviser, Department of Education.

Graduate Adviser. G. D. Yonge.

Minor Program Requirements:

Educational theory is considered to be the foundation or basic area for undergraduates to elect as a minor if they wish to (1) major in an allied program, (2) obtain a teaching credential, (3) obtain a master's degree in education or allied field, (4) obtain a Ph.D. degree in education, (5) enter a

NOTE: For key to footnote symbols, see page 123.

profession that focuses on work with people, (6) seek employment in governmental or industrial training programs, or (7) obtain a better understanding of the issues and concerns of public and private education.

	UNITS
Education (minimum units)	**20-23**
Education 110	4
One course from Education 120, 122, 123	4
Depth courses	12-15
At least 12-15 units from Education 100, 115, 116, 117A, 117B, 120, 122, 123, 130, 140, 145, 149, 151, 152 or 163, chosen in consultation with an Education adviser.	

Minor Advisers. All faculty members with professorial titles.

Courses in Education

Lower Division Course

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. Introduction to Teaching (3) I, II, III. Minnis, Crockenberg, Lowry
Lecture—1 hour; seminar—1 hour; field work—3 hours. Study of the classroom teacher's responsibilities and work place. Skills for observing classroom activities. Observing and tutoring in public schools.

110. Educational Psychology: General (4) I, II, III. Ehri, Sassenrath, Yonge
Lecture—3 hours; discussion—1 hour. Prerequisite: Psychology 1; upper division standing. Learning processes, cognitive development, individual differences, testing and evaluation.

114. Quantitative Methods in Educational Research (4) I, Yonge
Lecture—4 hours. Prerequisite: two years of high school algebra. Problems and methods in data analysis. Design of research projects. Some consideration of procedures suited to digital computers.

115. Educating Handicapped Children (4) III. The Staff
Lecture—4 hours. Prerequisite: upper division standing. Educational processes and skills required for teaching handicapped children who are integrated into regular classrooms.

***116. Chicano Children: Psychological Issues** (4) III. Figueroa
Lecture—4 hours. Prerequisite: course 110. Examination of psycho-educational literature on Chicano children within the framework of Erik Erikson's theories towards development of an assessment-intervention capability.

117A. Psychology of Reading (4) I, Ehri
Lecture—3 hours; discussion—1 hour. Prerequisite: Psychology 1; upper division standing. Theory and research on psycholinguistic processes involved in learning to read. Topics include reading readiness, word recognition and spelling, knowledge of the orthographic system, linguistic competence with speech, influence of dialect, interaction among components, difficulties of poorer readers.

117B. Psychology of Reading (4) II. Spring
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing; course 117A recommended. Theory and research on psychological processes involved in comprehension skills and their acquisition. Topics include comprehension at the word, sentence and passage levels.

120. Philosophical and Social Foundations of Education (4) I, II, III. Arnstine, Black, Troutner
Lecture—2 hours; discussion—2 hours. Prerequisite: upper division standing. Philosophical, historical, and sociological study of education and the school in our society.

122. Civil Rights of Teachers and Students (4) I, III. Crockenberg
Discussion—4 hours. Prerequisite: upper division standing. Rights of teachers and students under the U.S. and California Constitutions and under Federal and State laws. Emphasis on the rights of speech, press and assembly, religious autonomy, due process, equal protection and privacy.

123. John Dewey and the Foundations of Education (4) II. Arnstine
Lecture-discussion—4 hours. Prerequisite: upper division standing. The philosophical and social foundations of education as interpreted by Dewey. While focusing on his critique of American education and his systematic proposals for reform, attention will also be given to criticisms of Dewey.

130. Issues in Higher Education (4) III. Crockenberg, Arnstine, Milton (Mathematics)
Discussion—3 hours; field work—3 hours. Prerequisite: upper division standing or consent of instructor. Analysis of current issues in higher education and of some practical implications of varying philosophical approaches to the role of the university.

***130L. Issues in Higher Education Laboratory** (1-4) III. Arnstine, Crockenberg, Milton (Mathematics)
Discussion—1-2 hours; fieldwork-research—3-6 hours. Prerequisite: course 130 (with a passing grade) and consent of instructor. Individual and/or group research on a current issue in higher education. (P/NP grading only.)

140. Radical Education: Critique of Schooling (4) II. Troutner
Lecture—2 hours; discussion—2 hours. Prerequisite: designed primarily for upper division students with some background in social sciences. Discussion and analysis of the ideas of Illich, Marx (primarily through commentators), and Freire, particularly as these thinkers critically analyze schooling within the context of modern industrial, capitalistic society. A critical analysis of the conservative trend in education.

145. Aesthetics in Education (4) III. Arnstine
Lecture—2 hours; discussion—2 hours. Prerequisite: upper division standing. Considers the role of the arts in education. Examines various conceptions of the nature of art and aesthetic experience, and relates this to instructional procedures.

149. Teaching Urban Youth (4) II. Davis
Lecture—2 hours; discussion—2 hours. Prerequisite: upper division standing. Assessing, analyzing, and seeking solutions to urban educational problems. Emphasis will be on learning to understand and cope with problems in the urban classroom and school.

150. Tutoring Children and Youth (2) I, III. Davis
Lecture—1 hour; tutoring or teacher aide—3 hours. Prerequisite: upper division standing. Planning, choosing, and implementing strategies for tutoring or working as a teacher's aide in schools. An analysis of factors that affect pupil performance in schools. May be repeated twice for credit when tutoring is done in different major area.

151. Language Development in the Chicano Child (3) I, Merino
Lecture—3 hours. Prerequisite: some knowledge of Spanish and linguistics recommended. Bilingualism, first and second language acquisition, bilingual education, language assessment, Chicano Spanish and the role of dialect varieties in the classroom.

152. Communication Skills for Bilingual Teachers (3) III. The Staff (Merino in charge)
Lecture-discussion—2 hours; field work—3 hours. Prerequisite: course 151; Spanish 2, 8A-8B; consent of instructor. The development of communication skills of prospective educators with an emphasis on the study and use of standard Spanish and Southwest Spanish dialects in teaching science, mathematics, social science, music, art, and language arts to bilingual elementary school pupils.

163. Guidance and Counseling (4) I, II. Figueroa, Sandoval
Lecture—4 hours. Prerequisite: course 110 (may be taken concurrently). Nature and scope of pupil personnel services; basic tools and techniques of guidance; theory and practice of counseling psychology, with emphasis on educational and vocational adjustment.

164. Practicum Counseling (2) I, II, III. The Staff
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.)

170. Computers in Education (3) II. Fisher
Lecture—1 hour; discussion—1 hour; laboratory—2 hours. Prerequisite: upper division standing. Computers as devices for: instruction, problem solving, drill and practice, creative expression, resource acquisition, data management, communication, etc. Integrating computers into classrooms. Enhancing teacher effectiveness and productivity.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

Graduate Courses

200. Educational Research (2) I. Ehri
Lecture—1 hour; seminar—1 hour. Prerequisite: course 114 or the equivalent, or consent of instructor. A study of how to design, interpret, and conduct educational research.

203. Twentieth-Century Issues Over the Schools (4) 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) I, Troutner
Lecture—1 hour; discussion—1 hour; seminar—2 hours. A study and critical analysis of the implications of existential thought for education.

***205. The Concept of Mind in Teaching** (4) I, Arnstine
Seminar—4 hours. A philosophical analysis of the problems of educational practice which are created, aggravated, and sometimes solved by varying conceptualizations of mind and thinking.

207. Concepts of the Curriculum (3) II. Arnstine, Crockenberg
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Development of the skills of philosophical analysis in the examination of curriculum theory and practice, including the conceptual analyses of purposes, of the organization of subject matters, and the methods of instruction.

208. Education and the Law (4) I, Crockenberg
Seminar—4 hours. Prerequisite: graduate standing. An analysis of how selected areas of school law have developed, in particular the rights of students and teachers under the First and Fourteenth Amendments to the U.S. Constitution, criticism of the present state of that law, and an understanding of needed legal reforms.

***209. Pedagogics** (4) III, Yonge, Troutner
Seminar—4 hours. A critical analysis of the literature available in English dealing with theoretical and practical issues in education in terms of Pedagogics (i.e., an existential phenomenological approach to the systematic study of education).

211. Psychopedagogics (4) II. Yonge
Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. A phenomenological approach to the psychological aspects of the educational situation (psychopedagogics). A critical consideration of how psychopedagogics contributes to the theory and practice of education.

212. Language and Intellectual Development (4) III. Ehri
Seminar—4 hours. Prerequisite: consent of instructor. Theory and research on the development of language and thought in children; emergence of grammatical, semantic systems, and operational thought; implications for education.

213. Individual Assessment (4) I. Sandoval
Lecture—4 hours. Prerequisite: courses 114 and 219, admission to school psychology credential program. Theories of intellectual functioning and the measurement of cognitive abilities in school-aged children. Supervised practice in administration and scoring of contemporary tests for children including the WISC-R, the WAIS-R, the Stanford Binet, the McCarthy Scales of Children's Ability.

215. Motivation and Behavior Modification (3) II. Spring
Lecture—1½ hours; discussion—1½ hours. Prerequisite: course 110 or consent of instructor. Analysis of technologies for influencing behavior in educational settings, including theory and research on intrinsic and extrinsic motivation.

218. Testing Minority Children (4) II. Figueroa
Lecture—3 hours; field work—3 hours. Prerequisite: admission to school psychology program or to M.A. bilingual education program or consent of instructor. Emphasizing tests and techniques that are appropriate for use with Hispanic students. The use of multicultural pluralistic assessment. Review studies and guidelines on use of tests with minority children.

219. Educational Testing and Evaluation (3) III. Sassenrath
Seminar—3 hours. Prerequisite: courses 114 and 200 or consent of instructor. Study of test theory as it applies to research and evaluation in education, with an emphasis on general ability and reading tests.

251. Research in Bilingual and Second Language Education (3) I. Merino
Discussion—1 hour; seminar—2 hours. Prerequisite: course 151; knowledge of a foreign language. Discussion and analysis of recent research in bilingual and second language education. Topics include: language acquisition in second language learners and bilinguals, second language teaching methods, language use models in bilingual education, interaction analysis in bilingual/cross-cultural classroom, use of the vernacular in classroom.

252. Bilingual/Multi-Cultural Instructional Strategies and Curriculum (3) III. Merino
Seminar—2 hours; field work—3 hours. Prerequisite: proficiency in Spanish; courses 151, 152. Methods and techniques for developing, implementing, and evaluating bilingual/multi-cultural content and instruction in elementary school. Topics include use of cross-cultural strategies in classroom; recent cross-cultural research on motivation and cognition; development of multi-media bilingual cross-cultural curriculum.

253. Language Arts in Bilingual Education (3) II. Merino
Seminar—2 hours; field work—3 hours. Prerequisite: course 151 or the equivalent; proficiency in Spanish. Analysis and development of language arts curriculum for bilingual/cross-cultural classroom. Topics include: language assessment; methods of teaching reading in Spanish; use of dialect

NOTE: For key to footnote symbols, see page 123.

varieties in the teaching of reading; and methods of teaching English and Spanish as a first and second language.

270A. Reading Diagnosis and Prescription (3) I, III. 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.

270D. Clinical Laboratory and Seminar in Reading Problems (5) II-III. Bacon
Seminar—2 hours; laboratory—9 hours. Prerequisite: consent of instructor. Development and application of diagnostic and prescriptive techniques in a reading clinic. (Deferred grading only, pending completion of two-quarter sequence.)

271. Recent Developments in Social Studies Education (3) III. Lowry, Wampler
Lecture—2 hours; field work—2 hours. Prerequisite: consent of instructor. Analysis of the rationales, goals, objectives, and assumptions about learning and teaching strategies, and evaluation techniques in selected social studies curriculum projects.

272. Recent Developments in Science Education (3) II. Perkes
Lecture—3 hours. Prerequisite: consent of instructor. Analysis of contemporary science programs with special emphasis upon philosophical, psychological and pedagogical attributes of their design; trends, issues, and research in science curriculum and instruction.

273. Research in Mathematics Education (3) III. Ostergard
Lecture—2 hours; discussion—1 hour. Review of current issues and research in mathematics education.

275. Effective Teaching (4) I, Minnis
Seminar—4 hours. Review of research on the relationship of effective teacher behavior and student learning. Use of research on teacher effectiveness to develop teaching strategies. Ways to decide on the most appropriate instructional strategies in specific teaching situations.

277. Design of Staff Development Programs (4) III. Minnis
Seminar—4 hours. Use of research, best professional practices, and legislative guidelines to design staff development programs for public school personnel. Emphasis on school change and teacher initiated staff development programs. Consideration of political perspectives and the views of teacher organizations.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate student standing; consent of instructor. Small group study of topics of interest to related students and faculty. (S/U grading only.)

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 in the Elementary School (4) I, Bacon, Gatheral, Skinner
Lecture—3 hours; field work—3 hours. Prerequisite: graduate student standing. Principles, procedures, and curriculum materials for teaching of reading. Includes decoding skills with a special emphasis on phonics, comprehension skills, study skills, and reading in the content areas.

301. Reading in the Secondary School (4) II. Gatheral
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.

302. Language Arts in the Elementary School (2) I, Bacon, Gatheral, Skinner
Lecture—2 hours. Prerequisite: graduate standing. Principles, procedures, and materials for the teaching of oral and written expression, listening skills, drama, and children's literature in elementary schools.

303. Art Education (3) I, II. The Staff (Chairperson in charge)
Lecture—1 hour; discussion—1 hour; laboratory—2 hours. Prerequisite: admission to multiple subject credential program. Understanding the principles of education in the arts through participation. Development of concepts, introduction to media, and techniques suitable for the elementary school with emphasis on cross-discipline exploration.

304A. Teaching in the Elementary Schools (5-8) I. The Staff (Wampler in charge)
Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in preschool or elementary schools. Selection and organization of teaching materials. Introduction to techniques of diagnosing school achievement of children.

304B. Teaching in the Elementary Schools (5-8) II. The Staff (Wampler in charge)
Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: course 304A; acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in preschool or elementary schools. Current conceptions of elementary school curriculum, emphasis on contributions from the social, biological, and physical sciences. Emphasis on effective teaching methods.

304C. Teaching in the Elementary Schools (5-8) III. The Staff (Wampler in charge)
Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: course 304B; acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in preschool or elementary schools. Evaluation of teaching materials including audio-visual aids. Current elementary school curriculum with emphasis on contributions from fine arts and humanities.

305A. Teaching in the Middle Grades (5-8) I. The Staff (Wampler in charge)
Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequsite: acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in middle grades. Current conceptions of the middle-grades curriculum with emphasis on social, biological, and physical sciences. Effective teaching methods.

305B. Teaching in the Middle Grades (5-8) II. The Staff (Wampler in charge)
Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: course 305A; acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in intermediate grades. Selection, organization, and evaluation of teaching materials including audio-visual aids. Effective teaching methods in grades 4-9.

305C. Teaching in the Middle Grades (5-8) III. The Staff (Wampler in charge)
Lecture—2 hours; seminar—2 hours; student teaching—15-30 hours. Prerequisite: course 305B; acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in junior high school. Current conceptions of the junior high school with emphasis on effective teaching methods, and selection of curriculum materials. Alternative programs.

306A-306B-306C. Teaching in Secondary Schools (5-9) I, II, III. The Staff (Wampler in charge)
Seminar—2 hours; student teaching—10-21 hours. Prerequisite: acceptance into teacher education program. Supervised teaching in regular or special education secondary school classrooms. Techniques for classroom communications; constructing goals and objectives; assessment of learning; special problems of adolescents; audio-visual techniques. Must be repeated by undergraduates for a total of 15 units; 21 units by graduates in Physical Education and Music, and 24 units by all other graduate students.

309. Early Childhood and Kindergarten Education (3) III. Skinner
Lecture—3 hours. Prerequisite: upper division or professional student standing. Methods, materials, and history of educational programs for the preschool through primary grades. Development of curriculum methods and materials which stress integration of appropriate subject areas with emotional, social, creative, physical, and cognitive development.

313. Secondary Art Methods (3) I, The Staff (Chairperson in charge)
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: open to students with Art major or secondary teaching specialty, or consent of instructor. Current readings and discussion of contemporary art and teaching. Formulation of curriculum and practice of techniques used in secondary schools. Observation and evaluation of several secondary art programs.

322. Methods in Secondary Social Studies (4) I, Lowry
Lecture—4 hours. Prerequisite: acceptance into credential program or consent of instructor. Methods and materials of teaching concepts and thinking skills. Recent developments in applying basic skills to the teaching of social studies.

323. Secondary School Curriculum: Science (4) I, Perkes
Lecture—4 hours. Prerequisite: graduate or professional standing. Conceptions of science curriculum and instruction. Scientific knowledge and methods as applied to course design and teaching; rationale and objectives of science programs; laboratory as an environment for learning. Lecture, laboratory, observation, and participation in public schools.

324. Teaching Methods in Mathematics (3) II. Ostergard
Lecture—3 hours. Prerequisite: acceptance into a teacher education program; student teaching (concurrently); a mathematics background or consent of instructor. Methods and curriculum for teaching mathematics at the secondary level (grades 9-12). Review of innovative mathematics programs in the State.

341. Teaching in Colleges and Universities (3) II. Minnis
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing in any department or program. Analysis of course objectives. Teaching techniques for college instruction with emphasis on lecture and discussion. Evaluation of student performance and grading. Course and instructor evaluations.

351. Advanced Fieldwork in Bilingual Education: Teaching (3-5) I. The Staff (Merino in charge)
Seminar—2 hours; field work—3-9 hours. Prerequisite: acceptance into a bilingual education specialist program. Discussion, analysis and implementation of methods, techniques and material in the bilingual/cross/cultural classroom, including team teaching with paraprofessionals, implementation of language-use models in the classroom, lesson planning, selection and use of bilingual/cross-cultural materials.

352. Advanced Fieldwork in Bilingual Education: Evaluation and Supervision (3-5) II. Merino, Figueroa
Seminar—2 hours; field work—3-9 hours. Prerequisite: upper division standing; acceptance into a bilingual/cross-cultural specialist credential program. Provides opportunity to acquire evaluation and supervisory skills in the field under the supervision of University staff and an experienced program evaluator/supervisor in bilingual/cross-cultural education.

361A-361B-361C. School Psychology: Introduction (2-2-2) I-II-III. Sandoval and Staff
Seminar—2 hours; field work—½ school day per week. Prerequisite: admission to school psychology credential program. School applications of learning and developmental theory, institutional organizational theory, psychological theory and curriculum development, psychology of exceptional children in the school. Field work in the school and other institutions serving children. (S/U grading only.)

362A-362B-362C. School Psychology: Advanced (2-2-2) I-II-III. Sandoval, Figueroa
Seminar—2 hours; field work—½ school day per week. Prerequisite: course 361C and admission to school psychology credential program. Theories and techniques in school-based consultation, advanced individual and group counseling, crisis counseling, educational program evaluation, legal issues in school psychology. (S/U grading only.)

363A-363B-363C. School Psychology: Internship (4-8) I, II, III. Sandoval, Figueroa
Seminar—2 hours; 6-18 hours of internship per week. Prerequisite: admission to school psychology credential program. Individual assessment and program evaluation, mental health consultation, intervention strategies to promote the school learning and adjustment of children. Selected topics in school psychology. (S/U grading only.)

370. Advanced Fieldwork in Reading (2-6) I, II, III. Bacon, Gatheral
Seminar—1 hour; fieldwork—3-15 hours. Prerequisite: acceptance into a reading credential program. Fieldwork at elementary/secondary levels, using diagnostic/prescriptive techniques, and studying district in-service programs. May be repeated twice for credit up to a total of 6 units. (S/U grading only.)

380. Computer Programming in Education (4) III. Spring
Lecture—2 hours; laboratory—4 hours. Prerequisite: courses 110 and 170 or consent of instructor. Computer programming in a high-level language appropriate for teaching programming concepts to children in elementary and middle grades. Study of programming instructional methods and curriculum.

398. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: admission into a credential program; consent of instructor. Group study for students enrolled in a credential program. (S/U grading only.)

399. Individual Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: admission into a credential program; consent of instructor. Individual study for students enrolled in a credential program. (S/U grading only.)

Education Abroad Program

Robert A. Fahrner, Ph.D., Campus Coordinator
Campus Coordinator's Office, 150 Mrak Hall
(752-0392)

Program Office, 323 South Hall (752-3014)

Programs of Study

The Education Abroad Program (EAP) of the University of California offers upper division students who meet the minimal admission requirements (see page 48) the opportunity to experience a different

NOTE: For key to footnote symbols, see page 123.

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—debits and credits of participation in the EAP should be weighed carefully prior to departure, however.

Application

Normally, students participate in the program during their junior year, but a limited number of students may be selected for participation as seniors. A few programs are open to graduate students as well. Students considering study abroad with the EAP should contact the EAP Office or the Coordinator's Office early in the fall quarter concerning application and filing deadlines. This is important, as deadlines for some centers, including the United Kingdom and Ireland, are in early November.

Application forms are available from the EAP Office. A provisional academic planning form, prepared in consultation with the coordinator or academic counselor and the major adviser, must be submitted along with the completed application to the EAP Office prior to the appropriate deadline. Applications received after the official deadline cannot be considered.

Students who do not meet the minimal requirements for acceptance (page 48) must consult the Campus Coordinator. Students who will have accumulated more than 145 units prior to the beginning of their planned year of study abroad must also consult the Campus Coordinator before submitting an application; the probability of such students' being accepted is low.

Selection

The Academic Senate Committee on the Education Abroad Program is intimately involved in the selection of EAP participants on the Davis campus. This committee strongly recommends that prospective participants take appropriate courses dealing with the country of their interest in preparation for the year abroad. Applicants who are taking or have completed such courses at the time of the campus selection process tend to have an increased probability of receiving the endorsement of the Committee, other factors being equal. Lists of suggested courses and reading materials are available in the EAP Office and the Office of the Coordinator.

Once the completed application materials have been filed, an applicant will be interviewed by a selection committee consisting of Faculty and EAP returnees. Among other things, academic goals, knowledge of the host country and the United States and proficiency in the language of the host country, when applicable, will receive considerable attention during the interviews.

Files of applicants receiving the endorsement of the Senate Committee on EAP are forwarded to the Universitywide Office of the EAP on the Santa Barbara campus, where further selection decisions will be made.

Academic Program

In most cases, 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 have enrolled.

To assist in the adjustment and the academic work of the students, faculty members of the University of California serve as Directors and/or Associate Directors at most of the study centers abroad.

The academic program of each student includes: (1) an intensive preparatory course in the language of the host country (except for the programs in the United Kingdom, Ireland, Australia, Egypt, Ghana, and Kenya); (2) a full year of academic courses; (3) broad opportunity to audit courses within the host university. It is expected that students will complete a minimum of 36 units during the academic year in addition to units earned in the intensive language program.

Graduation Requirements

All prospective applicants, but particularly students who intend to study abroad during their senior year, should plan their course programs for Davis and abroad carefully in order to satisfy University, College, and major requirements for the degree. The provisional planning form is intended to take care of this, but a few potential problems deserve emphasis.

Although units and grade points earned in the EAP are incorporated into the University transcript and GPA, the major departments and programs retain the right to determine which EAP courses will be accepted in satisfaction of major requirements. Several major programs have identified key upper division courses which must be completed in residence at Davis. Major advisers should be consulted early so that the pre-departure program at Davis will be planned appropriately.

All degree candidates must meet the University residence requirement (page 62). Students planning to graduate immediately upon completion of participation in the EAP may satisfy residence requirements within the final 45 units preceding entrance into the EAP. Otherwise, subject to prior approval of the major department or program concerned, the requirement may be satisfied as follows: Within the final 90 units earned toward the degree, 35 units must be completed in residence in the student's College or School, 12 units of which must be completed after returning from EAP participation. With this option, no more than 55 units taken abroad may be applied toward the unit requirement for graduation. The applicant's College or School Dean is the source for information on the University residence requirement and additional residence requirements that may be imposed.

Participants who satisfy all degree requirements while abroad and expect to graduate upon completion of the year abroad should file for candidacy to receive the degree in September. Unfortunately, transcripts from abroad take a long time to get to the home campus and are not received in time for EAP returnees to be included on the June degree list. Such returning students may participate in the June commencement ceremony, however.

Study Centers

At any one center, the courses and fields of study open to UC students may be limited. Moreover, each of the host institutions has special areas of excellence and strength. The listing of centers below incorporates selected information concerning these points. More detailed information is available in the flyers describing each of the centers and from the academic counselor in the Coordinator's Office.

In addition to the programs listed below, Davis students have access to certain special programs, such as the UC Davis-Quebec exchange. Information can be obtained in the EAP Office at South Hall.

Europe

Austria. The program is small and is designed to offer an opportunity to pursue a specialized interest to a limited number of highly qualified students. A compulsory intensive language course at Georg-August University in Goettingen, Germany, precedes the beginning of the academic year. All courses are taught in German.

University of Vienna. Eastern European studies (Balkans, Soviet Union), fine arts (history of art, music, theatre arts), folklore, history. (This is a cooperative program with Stanford University.)

France. A compulsory intensive language course precedes the beginning of the academic year. All courses in the universities are taught in French. UC faculty directors are in residence at Bordeaux, Grenoble, and Paris.

University of Bordeaux. Broad areas of the humanities and social sciences. The Institute of Political Science and the Institute of Prehistory (Anthropology) are well known.

University of Grenoble. Mainly in the social sciences through the Université des Sciences Sociales (Grenoble II); some humanities. Offerings in anthropology and psychology are limited. Not suitable for physical or life sciences.

University of Marseille. Biological sciences and environmental marine biology. The Marseille program is open only to students in the biological sciences.

University of Montpellier. Humanities and literature, primarily through Paul Valéry University.

University of Paris. Film studies and some theatre studies. Graduate programs in history and literature.

Pau-Paris. The participants spend the first semester at the University of Pau and then, at the end of January, move to Paris to study at the University of the New Sorbonne (Paris III). In addition to required core courses in French civilization, students are able to take courses in humanities and social sciences, with emphasis on comparative cultural studies, French civilization and language.

University of Poitiers. Humanities, with major emphasis in history and medieval studies; mathematics; physics.

Germany. A compulsory intensive language program precedes the beginning of the academic year. All courses are taught in German.

Georg-August University, Goettingen. Broad curriculum covering most majors. Excellent science programs, with substantial strength in biology, chemistry, and physics. Space in laboratory courses in biology and psychology may be limited.

Italy. A compulsory intensive program in language and history precedes the beginning of the academic year. Students who have completed only one year of Italian may become eligible for participation by attending, prior to departure, a summer intensive-language program offered by a UC campus in order to attain the required third-year level, followed by the normal compulsory-intensive language program in Padua. A UC faculty director resident in Padua administers all EAP programs in Italy. All courses are taught in Italian.

University of Padua. History of art (including archaeology), Italian literature (including linguistics), and political science (which includes history, social sciences, geography, and demography, as well as political science in the American sense). Sciences are not available for UC students.

Conservatorio di Musica G.B. Martini, Bologna. Individual instruction in music performance; composition; music history. An audition is required for admission.

Accademia delle Belle Arti di Venezia, Venice. Art studio and some art history. Colored slides of portfolio of artistic work must be submitted for admission.

Cini Foundation, Venice. Independent study projects for graduate students in art history.

NOTE: For key to footnote symbols, see page 123.

Norway. Knowledge of Norwegian is not required, but a compulsory intensive course in Norwegian (mid-June to mid-August) precedes the beginning of the academic year. Intensive language study is continued during the fall semester. All courses are taught in Norwegian.

University of Bergen. Humanities, social sciences, natural sciences, and mathematics are available, but space in the sciences may be limited. The usual pattern is study of a single subject, usually the major or a closely allied field, for the entire year.

Spain. A compulsory intensive language program precedes the beginning of the academic year. All instruction is in Spanish.

University of Barcelona. Humanities (with emphasis on Spanish art, history, literature, linguistics) and some social sciences. Courses developed for the Center and taught by the University of Barcelona form the core of the program. EAP students are required to take at least one regular year-long course in the University of Barcelona. (This is a cooperative program with the University of Illinois.)

University of Madrid. Humanities and some social sciences. The core program, developed for the UC Study Center and other American programs, concentrates on Spanish studies in the broadest sense. Core and Study Center courses are taught by Spanish faculty. EAP students are required to take one regular year-long course in the University of Madrid.

Sweden. Compulsory intensive language course during the summer for students who are not already fluent in Swedish. Language study continues during the fall semester for all students until the student has gained the equivalent of two years of Swedish. Most courses are taught in Swedish, but a few courses offered in English may be available.

University of Lund. Broad curriculum. Excellent science programs.

United Kingdom and Ireland. The program, which includes 14 institutions, is administered by a director and associate director located in London. The UK program is highly competitive, largely due to its popularity with students. Following selection for participation by the EAP administration, a student must still be accepted by a specific department in one of the host institutions. In many host institutions, the student can pursue studies in that department only. Participating institutions are

England: *University of Birmingham, University of Exeter, University of Hull, University of Kent at Canterbury, University of Lancaster, University of Leeds, University of Sussex, Westfield College (of the University of London), University of York.* Occasionally, students may be placed on an *ad hoc* basis at other institutions.

Ireland: *Trinity College (of the University of Dublin).*

Scotland: *University of St. Andrews, University of Stirling.*

Wales: *University of Wales (at Aberystwyth and Lampeter).*

Generally, the host universities offer a broad curriculum that includes most liberal arts majors. Life sciences and physical sciences are available.

USSR. The Russian program is a one-semester program organized by a consortium of American universities. Three years of Russian at the university level is a firm prerequisite. The program is primarily intended for language majors, but it is open to students of literature, history, area studies, etc.

Leningrad State University. Russian language and civilization only.

Middle East

Egypt. All courses are taught in English, except courses in Arabic language and literature.

The American University of Cairo. A broad curriculum offered by the Faculty of Arts and Sciences. All students are required to take at least one year-long course in Arabic. Offerings in science are limited.

Israel. First priority is given to students who have completed at least one year of Hebrew. A compulsory language course precedes the beginning of the academic year. Study centers in Israel are administered by a UC faculty director located in Jerusalem.

University of Haifa. Humanities and social sciences, with special emphasis on contemporary Israel and Arab-Jewish studies. Limited opportunities in the sciences. Special program in Underwater Archaeology. Courses are taught in Hebrew. The Department of Study Programs for Overseas Students offers a core curriculum in Jewish, Middle East and Israeli studies, social sciences, and history of modern Israel in English.

Hebrew University, Jerusalem. Broad curriculum; emphasis on Israel and Middle Eastern studies. UC students enroll in a special program for foreign students, taught in English. The program offers courses in Judaic, Israeli, Middle Eastern studies, and a few courses in the general social sciences and humanities. Students with command of Hebrew have access to a broad curriculum throughout the Hebrew University.

Asia

Hong Kong. A limited selection of courses is offered in English. Knowledge of Chinese is not required for acceptance; however, all students are required to complete at least two courses in Chinese culture, history, or language prior to departure. A compulsory intensive Cantonese program precedes the beginning of the academic year. All students are required to include 18 units of Mandarin or Cantonese in their annual program.

Chinese University of Hong Kong. Humanities and social sciences, with emphasis on Chinese studies. Art studio and music performance courses are available. (Information about courses to be offered in English is announced only one week before instruction begins.)

India. Instruction is in English. A compulsory intensive language program in conversational Hindi precedes the academic year. Students will take a year-long core program focusing on development in modern India and Indian culture and tradition, as well as continue their study of Hindi. During the second and third quarters, students will also take regular coursework at the University of Delhi.

University of Delhi. Humanities and social sciences are well represented, with some offerings in fine arts and mathematics.

Japan. Completion of one year of Japanese at the university level or the equivalent is required for acceptance. (A compulsory intensive language course precedes the academic year.) Students are expected to complete an additional 18 units of Japanese language during their year in Japan. A limited number of courses taught in English are available.

International Christian University, Mitaka (Tokyo). Humanities and social sciences; emphasis on Japanese language and intercultural communication.

University of Tsukuba. Open to graduate students only. Admission requires completion of at least two years of college-level Japanese. Major fields of graduate study are available; most UC students will be accepted in the Area Studies program.

People's Republic of China. Programs in Nanjing and Beijing for either a semester or a year are available through the Council on International Educational Exchange. Intensive language study in Mandarin Chinese is the primary emphasis in both programs.

Nanjing University. This single-semester program combines intensive intermediate language instruction with courses in Chinese history and contemporary culture. The preprequisite is one year of college-level Mandarin Chinese.

Beijing University. Semester and year-long programs focus on advanced level instruction in Mandarin Chinese language and literature. Courses are conducted by the Chinese Language Teaching to Foreigners Division of Beijing University. The prerequisite for both programs is three years of college-level Mandarin Chinese.

Taiwan, Republic of China. Students participating in the Chinese Language and Culture Studies program in Taipei receive instruction in the Mandarin Chinese language and enroll in lecture courses (taught in English) on Chinese culture and society arranged by CSU International Programs. Courses in art history, literature, economics, history and political science are available. Prior coursework in Chinese culture, history and language are recommended. (This is a cooperative program with California State University International Programs).

Africa

Kenya. Enrollment 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.(Since operation of the Center is unpredictable, interested students should contact the EAP Office in South Hall for the latest status reports.)

University of Nairobi. Humanities and social sciences, with emphasis in African studies. Limited opportunities in the sciences and in veterinary science. Graduate students in history, political science, sociology, architecture, and design may associate with the Institute for Developmental Studies, Institute for African Studies, or the Housing and Research Development Unit.

West Africa. The West-African Study Center includes three universities in three different countries: The University of Ghana (Ghana), Fourah Bay College (Sierra Leone), and the University of Benin (Togo). A UC faculty director is in residence at the University of Ghana. The Center is intended primarily for students with interests in various aspects of African studies. (Since the operation of the West African Center is unpredictable, interested students should contact the EAP Office in South Hall for the latest status reports.)

University of Ghana, Legon-Accra, Ghana. Open to undergraduate and graduate students. As in the British system, students take a year-long program of study in a single area. End-of-year examinations are given only once and are mandatory for credit to be awarded.

Offerings include humanities and social sciences, and some science. Emphasis is on African studies. There is a strong program in ethnomusicology.

Fourah Bay College, Freetown, Sierra Leone. Fourah Bay College is a constituent college of the Federal University of Sierra Leone. Since the College follows the British system, students will take a program of year-long courses in a single area. End-of-year examinations are given only once and are mandatory for receiving credit. Extensive course offerings on Africa-related topics, social sciences, the arts, and some science and engineering are available. There is an Institute of African Studies and an Institute of Marine Biology and Oceanography.

University of Bénin, Lomé, Togo. The University of Benin follows the French system. Two years or the equivalent of college-level French are required and participants must attend a compulsory intensive language and orientation program in Togo prior to the beginning of the academic year.

The School of Letters offers programs in African literature, history, geography, philosophy, and applied social sciences, all with emphasis on Africa.

NOTE: For key to footnote symbols, see page 123.

Latin America

Brazil. Language requirements for admission to this program are: two years of college-level Portuguese or the equivalent; or one year of college Spanish and one year of college Portuguese; or two years of college Spanish and completion of an intensive course in Portuguese *prior to departure.* Since courses are taught in Portuguese, the equivalent of one year of college-level Portuguese is the absolute minimum. A compulsory intensive language course precedes the beginning of regular course work.

University of São Paulo. Brazilian literature, Portuguese language, arts, humanities, social sciences. (This is a cooperative program with the University of Indiana.)

Mexico. A compulsory intensive language program precedes the beginning of the academic year. Students usually enroll in courses offered by the School for Foreign Students. Those who are qualified have access to the full curricular offerings of the host university.

Universidad Nacional Autonoma de Mexico (UNAM), Mexico City. Humanities, social sciences, art practice. The School for Foreign Students offers Latin American art, literature, and history; Mexican and Central American studies; and Spanish language and literature.

Study and Field Experience (SFE) in Mexico. Available for either Fall or Spring Quarter, the SFE program begins in Mexico City with six weeks of intensive language courses and a course on contemporary Mexico. The final weeks of the program are spent doing volunteer work in a community outside of Mexico City to complement formal coursework.

Peru. A compulsory intensive language course precedes the beginning of the academic year. All courses are taught in Spanish.

Universidad Catolica, Lima. Humanities, social sciences. Anthropology, archaeology, and ethnohistory are of special interest. (This is a program of the Peru Consortium, which is composed of the University of Indiana and a number of California universities.)

Australia

The Australian program includes the Australian National University in Canberra, and three institutions located in the Melbourne area, University of Melbourne, Monash University and La Trobe University. A full range of academic programs is available. The Study Center accommodates a limited number of students. A UC faculty member in Melbourne directs all programs. The universities follow the British system of higher education.

As is appropriate in the Southern Hemisphere, the academic year extends from the beginning of instruction in early March through the examination period, which starts in November. UC participants must leave for Australia in February, and will be unable to attend classes during the winter term preceding departure. Applications for participation in the Australian program are due in May 1985 for a February 1986 departure.

Endocrinology (A Graduate Group)

George H. Stabenfeldt, D.V.M., Ph.D., Chairperson of the Group

Group Office, 1122C Medical Sciences 1A (Reproduction) (752-3084)

Graduate Study. The interdepartmental Graduate Group in Endocrinology offers programs of study leading to the M.A. and Ph.D. degrees. The M.A. degree is offered under Plan I (thesis) of the master's program. Detailed information regarding graduate study is available through the Group Chairperson or by obtaining the *Announcement of the Graduate Division.*

Graduate Advisers. Contact the Program Office, or see the *Class Schedule and Room Directory.*

Engineering

(College of Engineering)

Mohammed S. Ghausi, Ph.D., Dean
Roy Bainer, M.S., LL.D., Dean Emeritus
James F. Shackelford, Ph.D., Associate Dean—Undergraduate Study
Zuhair A. Munir, Ph.D., Associate Dean—Graduate Study
Ray B. Krone, Ph.D., Associate Dean—Research

College Office, 2132 Bainer Hall

The Major Programs

Seventeen undergraduate engineering curricula, including four formal double-major programs, are offered. Each of these is a four-year program leading to the degree of Bachelor of Science. The Agricultural, Chemical, Civil, Electrical, and Mechanical Engineering curricula are five programs which have been accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc., the nationally recognized accrediting body for engineering curricula.

Major Advisers. For adviser assignment or change of adviser, contact the College Undergraduate Office.

Graduate Study

See pages 94 and 81. For additional information refer to the *College of Engineering Bulletin,* obtainable from the College Undergraduate Office.

B.S. Major Requirements:

Except for the individual major, the four-year undergraduate program is divided into two parts, namely the appropriate **Lower Division Program** and the **Upper Division Program** of your choice.

Lower Division Curricula

Students who enter the College of Engineering with *fewer than 84* quarter units of credit follow one of the three Lower Division Programs shown below. The first program (I) is for students in all majors other than Chemical Engineering or Agricultural Engineering—Forest Engineering option, the second (II) is for majors in Agricultural Engineering—Forest Engineering option, and the third (III) is for majors in Chemical Engineering and the double major. The Lower Division Program for students who enter the College with 84 or more quarter units of credit is listed under the section, Admission to Advanced Standing (page 74).

Engineering—Lower Division Program I

Requirements common to all Engineering majors except Agricultural Engineering—Forest Engineering option, Chemical Engineering, and the double major, Chemical Engineering/Materials Science and Engineering.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus—Mathematics 21A-21B-21C	12	1-2-3
Linear algebra—Mathematics 22A	3	6
Differential equations—Mathematics 22B	3	5
Vector analysis—Mathematics 22C	3	4
General physics—Physics 8A-8B-8C-8D	16	3-4-5-6
General chemistry—Chemistry 1A-1B or 4A-4B	10	2-3 or 4-5
Introduction to engineering systems—Engineering 3 (Engineering 3 is designed for freshman students. More advanced students may petition to substitute 3 units of technical electives for Engineering 3.)	3	1 or 2
Engineering graphics in design—Engineering 4 (Majors in Computer Science and Engineering and Electrical Engineering must substitute Computer Science Engineering 80 for Engineering 4.)	3	1 or 2
Applications of computers—Engineering 5 (Majors in Computer Science and Engineering and Electrical Engineering must substitute Computer Science Engineering 8 for Engineering 5.)	3	2 or 3
Circuits—Engineering 17	3	5 or 6
Statics—Engineering 35	3	4 or 5
Properties of materials Engineering 45	4	4 or 6
Expository writing—one course from English 1, 3, Comparative Literature 1, 2 or 3	4	1 or 2
Introduction to public speaking or group communication—Rhetoric 1 or 3	4	6
Humanities-social sciences electives (see page 78)	9	
Unrestricted electives (Civil Engineering majors take Civil Engineering 10 in place of 3 units of unrestricted electives.)	7	
Total Lower Division Units	**90**	

Agricultural Engineering (Forest Engineering option)—Lower Division Program II

Requirements for major in Agricultural Engineering (Forest Engineering option) only.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus, Mathematics 21A-21B-21C	12	1-2-3
Linear algebra, Mathematics 22A	3	6
Differential equations, Mathematics 22B	3	5
Vector analysis, Mathematics 22C	3	4
Sampling of mathematical statistics, Statistics 32 or 130A	3 or 4	4 or 5
General physics, Physics 8A-8B-8C-8D	16	3-4-5-6
General Chemistry, Chemistry 1A-1B or 4A-4B	10	2 or 3
Principles of biology, Biological Sciences 1	5	4
Introductory survey to botany, Botany 2	5	5
Introduction to engineering systems, Engineering 3 (Engineering 3 is designed for freshman students. More advanced students may petition to substitute 3 units of technical electives for Engineering 3.)	3	1 or 2
Engineering graphics in design, Engineering 4	3	1 or 2
Applications of computers, Engineering 5	3	2 or 3
Circuits, Engineering 17	3	5 or 6
Statics, Engineering 35	3	4 or 5
Properties of materials, Engineering 45	4	4 or 6

NOTE: For key to footnote symbols, see page 123.

Introduction to surveying, Civil Engineering 10	3	6
Expository writing, English 1 or 3 or Comparative Literature 1, 2, or 3	4	1 or 2
Introduction to public speaking or group communication, Rhetoric 1 or 3	4	
Humanities-social sciences electives	9	
Total Lower Division Units	**99-100**	

Chemical Engineering—Lower Division Program III

Requirements for major in Chemical Engineering and the double major, Chemical Engineering/Materials Science and Engineering only.

	UNITS	QUARTER USUALLY TAKEN
Required Courses		
Calculus—Mathematics 21A-21B-21C	12	1-2-3
Linear algebra—Mathematics 22A	3	6
Differential equations—Mathematics 22B	3	5
Vector analysis—Mathematics 22C	3	4
General Physics—Physics 8A-8B-8C-8D	16	3-4-5-6
General Chemistry—Chemistry 4A-4B-4C	15	1-2-3
Organic Chemistry—Chemistry 128A, 128B	6	4-5
Organic Chemistry laboratory—Chemistry 129A	2	4
Engineering applications of computers—Engineering 5	3	2 or 5
Circuits—Engineering 17	3	6
Statics—Engineering 35	3	5
Properties of materials—Engineering 45 (required only for Chemical Engineering/Materials Science and Engineering majors)	4	4
Expository writing—one course from English 1, 3, Comparative Literature 1, 2, or 3	4	2 or 3
Introduction to public speaking or group communication, Rhetoric 1 or 3	4	2 or 3
Humanities-social sciences electives	16	
Total Lower Division Units	**93 or 97**	

Upper Division Curricula

If you have completed the requirements for the lower division program or have entered the College of Engineering with *more than 84* quarter units of credit, you should follow the upper division requirements for the major you have selected from the programs that follow.

Aeronautical Science and Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Aeronautical science and engineering is the application of scientific knowledge to the design, manufacture and operation of aircraft. The fundamental disciplines of this branch of engineering apply to all bodies and vehicles whose applied loads are influenced by aerodynamic forces. Within this context aeronautical engineers are involved with automobiles, trains, ships and submarines, aircraft, rockets and missiles, sports equipment, and a variety of energy systems. The program leading to the Bachelor of Science degree in Aeronautical Science and Engineering is designed to provide a broad background and fundamental education in mathematics, the physical sciences, and the engineering sciences. These fundamentals, when complemented by the required technical courses, prepare the student for immediate employment in government or industry, while simultaneously establishing an excellent basis for graduate studies.

Aeronautical science and engineering is usually intended to indicate confinement of the subject matter to atmospheric studies. This is the situation regarding the undergraduate curriculum at UCD. The fundamental engineering disciplines are supplemented with courses in aircraft propulsion, aerodynamics, performance, stability and control, aircraft preliminary design, and aeronautical structures.

A broad range of technical elective courses is available. Some students choose these electives from one area of study in order to begin developing a specialty. Others choose courses from several areas in order to broaden their background in the sciences and engineering. Typical aeronautical science and engineering specialties include aerothermodynamics, propulsion systems, aircraft performance, stability and control, aeronautical structures, flight testing, or component and mechanism design. In any case, it is recommended that students consult with their adviser before selecting technical electives.

Minimum units required for major: 188.

	UNITS
Subject Areas and Courses	
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics—Engineering 105A, 105B, Mechanical Engineering 165	9
Fluid mechanics—Engineering 103A, 103B, 103L	7
Aeronautical engineering fundamentals—Mechanical Engineering 125	3
Aerodynamics—Mechanical Engineering 126, 127	8
Aircraft propulsion, performance, stability and control—Mechanical Engineering 128, 129, 162	12
Aircraft preliminary design—Mechanical Engineering 130	4
Aeronautical structures—Civil Engineering 131B, 135	6
Measurement systems—Mechanical Engineering 176	3
Controls and system analysis—Mechanical Engineering 171	4
Applied mathematics—Engineering 180	3
Technical electives (see above)	8
Students are urged to consider choosing from Engineering 102L, 105L, 106, 118, 122, 140, 142, 190; Mechanical Engineering 124, 150A, 150B, 161, 166, 172; Electrical and Computer Engineering 150; Applied Science 115; Civil Engineering 131A.	
Humanities-social sciences electives	15
Total Units for Upper Division Program	**98**

Agricultural Engineering

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

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

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

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. The packaging of foods is studied in terms of interrelationships between properties of foods, environmental conditions, and packaging materials. Concepts of handling, size reduction, storage, refrigeration, drying, freezing, food manufacturing, and others are studied.

Suggested technical electives:
Agricultural Engineering 133, 165
Applied Science 115
Biochemistry and Biophysics 101A, 101B
Chemistry 5, 8A, 8B, 107A, 107B
Chemical Engineering 151
Electrical and Computer Engineering 150
Engineering 103B, 105B, 111, 122, 140
Food Science and Technology 104, 108, 111, 131, 150
Mechanical Engineering 152, 155, 165, 166, 176

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

Suggested technical electives:

Agricultural Engineering 140, 141, 165
Atmospheric Science 105, 133
Civil Engineering 141, 141L, 142, 144
Engineering 111
Water Science 103, 104, 110, 111, 141, 142, 150, 154, 160, 172

Power and Machinery involves the design, development, and application of field machines and power units for crop production. The economic and energy utilization 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, 117, 119, 165
Agricultural Engineering Technology 233
Civil Engineering 131A, 132A
Engineering 102B, 104B, 111, 122, 140
Mechanical Engineering 150A, 150B, 151, 152, 171, 176

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

Suggested technical electives:

Agricultural Engineering 165
Atmospheric Science 20, 105, 124, 125, 133, 149A
Civil Engineering 131A, 131B, 132A, 132B, 132C, 134, 147, 148A, 148B, 149A, 149B
Mechanical Engineering 165
Physiology 110, 149

Agricultural Engineering

(Except Forest Engineering Option)

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

NOTE: For key to footnote symbols, see page 123.

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Applied mechanics and thermodynamics—Engineering 102A, 103A, 104A, 105A, and two courses from Engineering 102B, 103B (or Civil Engineering 141), 104B, 105B	18
Electronic circuits—Engineering 100	4
Design—Agricultural Engineering 170A-170B-170C plus one of the following courses: Civil Engineering 132A or 145 or Mechanical Engineering 150A	11
Engineering economics—Engineering 106	3
Professional responsibilities—Engineering 190	3
Mathematics elective Select from Applied Science 115; Engineering 118, 180; Mathematics 128A; Statistics 32, 130A	3
Agricultural engineering	20
(a) Agricultural Engineering 114, 125, 134, and one course from Water Science 160, Agricultural Engineering 140, or 141.	
(b) Select at least 8 units from Agricultural Engineering 112, 115, 117, 119, 133, 140, 141, 165, Engineering 111, Water Science 160.	
Agricultural and biological sciences electives Select from Agronomy 100; Animal Science 2; Bacteriology 2; Biochemistry and Biophysics 101A, 101B; Biological Sciences 1; Botany 2; Entomology 112; Nutrition 103; Physiology 110, 149; Plant Pathology 120; Plant Science 2, 112; Soil Science 100, 109, 122, 150; Vegetable Crops 101; Water Science 103; Wildlife and Fisheries Biology 120; Zoology 2. Must include one upper division course.	6
Technical electives At least 6 units must be selected from upper division engineering courses.	7
Humanities-social sciences electives	15
Total Units for Upper Division Program	**90**

Agricultural Engineering (Forest Engineering Option)

Minimum units required for major: 212.

Subject Areas and Courses	UNITS
Applied mechanics—Engineering 102A, 103A, 104A, 104B	12
Applied thermodynamics—Engineering 105A	3
Electronic circuits—Engineering 100	4
Design—Agricultural Engineering 170A-170B-170C plus one of the following courses: Civil Engineering 132A or 145 or Mechanical Engineering 150A	11
Engineering economics—Engineering 106	3
Professional responsibilities—Engineering 190	3
Forestry summer field study—Forestry 100A, 100B, 100C, 100D (offered by Berkeley campus)	15
Forest engineering—Forestry 103* (Berkeley campus), Agricultural Engineering 115, 116	8
Forestry—Forestry 113*, 125* (Berkeley campus)	9
Forestry electives Select from Forestry 101, 102, 110A, 110B, 114, 120, 122; Forestry Products 131, 132, 133, 141 (Berkeley campus).	12
(*Note: Excess credit resulting from Berkeley semester courses may be applied toward Forestry electives requirement.)	
Engineering electives Select from Agricultural Engineering 112, 114, 117, 119, 165; Civil Engineering 153, 171; Engineering 102B, 103B, 111, 122, 140; Mechanical Engineering 150B, 152, 155.	12
Technical electives Must be selected from engineering courses.	6
Humanities-social sciences electives	15
Total Units for Upper Division Program	**113**

Forest Engineering Option

Forest Engineering is the application of engineering principles and silvicultural knowledge in the management of forests and forest land. Ecological, aesthetic, and recreational aspects of this renewable natural resource are integrated into systems for the production of wood products. Students study systems and equipment for timber harvesting, forest residue management, reforestation, forest recreational facilities, soil and water control and conservation, forest road development, materials handling, and other phases of forestry. This option is administered in cooperation with the Department of Forestry and Resource Management at UC Berkeley. Your junior year is spent on the Berkeley campus, following a ten-week summer field course sequence at the UC Forestry Camp near Quincy.

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

Suggested technical electives:

Atmospheric Science 105
Geography 161
Resource Sciences 100
Water Science 141
Forestry 105 (at Berkeley)
Any elective listed under Upper-Division Program for Forest Engineering Option and not used to fulfill a specific requirement

Chemical Engineering

Chemical Engineering is concerned with application of the principles of chemistry and engineering to the production of useful products. The products of the process industries range from antibiotics to zirconium, from petroleum to plutonium, from agricultural chemicals and foods to synthetic plastics. Chemical engineers are increasingly concerned with chemical and engineering processes related to the environment, food production, and medicine. Preparation for careers in chemical engineering requires an understanding of both engineering and chemical principles to develop proficiency in conceiving, designing, and operating new processes.

The Chemical Engineering curriculum has been planned to provide a sound knowledge of engineering and chemical sciences so that you may achieve competence in treating not only current technical problems but also those that will arise in the technologies of the future. In the junior year attention is focused on basic engineering courses, particularly thermodynamics, fluid mechanics, and energy transfer. In the senior year these fundamentals are drawn together and applied in a study of mass transfer phenomena and processes, process design, and process dynamics. The program is strengthened and broadened with introductory courses in the electrical and mechanical sciences.

The curriculum includes 18 units of technical electives which allow you to strengthen specific areas in Chemical Engineering, to explore new areas, or to pursue areas of specialization. You are free to choose your own technical electives. The most popular areas of specialization, together with lists of suggested technical electives, are identified and discussed in the following paragraphs.

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

Applied Chemistry: The Chemical Engineering curriculum includes an important core of chemistry courses. Students can take advantage of this background to build a strong program in chemistry by choosing electives from among advanced undergraduate chemistry courses.

Suggested technical electives:

Chemistry 111A, 121, 124, 128C, 129B, 129C, 130, 131, 150

Applied Mathematics: The mathematics specialization is designed both to strengthen the student's understanding of the foundations of engineering science and to improve the ability to treat complex engineering problems. Courses in abstract algebra, advanced calculus, and the theory of differential equations provide a sound theoretical background, while courses in analytical and numerical analysis provide the techniques for solving a wide range of engineering problems.

Suggested technical electives:

Applied Science 115
Mathematics 118A, 118B, 119, 127A, 127B, 127C, 128A, 128B, 128C, 132A, 132B, 185A, 185B
Statistics 130A, 130B

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

Suggested technical electives:

Bacteriology 2, 102
Biochemistry and Biophysics 101A, 101B, 101L, 123, 123L, 133
Chemical Engineering 161, 226, 246
Food Science and Technology 206

Electronics Processing: Because the manufacture of semiconductor devices, integrated circuits, and magnetic bubble memories, tapes, and disks involves the application of chemistry and engineering principles, chemical engineers are finding productive careers in the electronics industry. The electronics processing specialization introduces the student to the analysis and design of modern circuits and devices and provides a strong background in layout and fabrication of such devices.

Suggested technical electives:

Chemical Engineering 163
Electrical and Computer Engineering 115A-115B, 140, 145A, 145B, 145C

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

Suggested technical electives:

Engineering 111, 160, 162
Agricultural Engineering 112
Mechanical Engineering 161, 162, 166

Environmental Engineering: The environmental engineering area of specialization prepares the student to deal with problems of environmental quality by developing knowledge of fundamental chemical and transport phenomena, that is, chemical reaction processes coupled with fluid mechanics, heat transfer, and mass transfer. Such a foundation in basic chemical engineering science, plus the usual chemical engineering analysis and design courses, along with other courses involved specifically with environmental topics, prepares the student to seek employment with industry or government. For this specialization six courses should be selected from the following list:

Suggested technical electives:

(Air Environment)
Atmospheric Science 121A, 121B, 158
Civil Engineering 149A, 149B, 242B, 244
Environmental Toxicology 131

NOTE: For key to footnote symbols, see page 123.

(Water Environment)
Bacteriology 2
Biochemistry and Biophysics 101A, 101B
Chemical Engineering 161
Civil Engineering 147, 148A, 148B, 240, 243A, 243B, 246A, 246B
Water Science 41

Food Process Engineering: This area of specialization prepares students to do graduate work in food science and technology and to work in the food processing industry.

Suggested technical electives:

Bacteriology 2
Biochemistry and Biophysics 123, 123L
Chemical Engineering 161
Food Science and Technology 104, 104L, 111, 119AT, 131, 150, 150L

Prebiomedical Engineering: This area of specialization is designed to prepare you for graduate work in biomedical engineering. Early planning of a complete course schedule in consultation with a Chemical Engineering adviser is important to provide space for Biological Sciences 1.

Suggested technical electives:

Four to six courses from Anatomy 100; Biochemistry and Biophysics 101A, 101B; Biological Sciences 1; Physiological Sciences 101A, 101B; Physiology 110, 111A, 111B, 112, 113, 114

Premedical: Inclusion of both organic and physical chemistry in the curriculum allows you to complete the premedical requirements while satisfying the requirements of the Chemical Engineering major. Those electing the premedical (including preveterinary) area of specialization should verify the specific preparation requirements with a pre-med adviser before making a final decision on electives. In order to insure that room is provided in your program for the biology courses, it is important to prepare a course schedule (with a Chemical Engineering adviser) as early in your freshman year as possible.

Suggested technical electives:

Chemistry 128C
Three to five biology or biochemistry courses such as Biochemistry and Biophysics 101A, 101B; Biological Sciences 1; Genetics 100A; Physiology 110, 112, 113, 114; Zoology 2-2L, 100

Chemical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 187.

Subject Areas and Courses	UNITS
Engineering—Engineering 100, 106	7
Chemical Engineering—Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 158, 159, 160	52
Chemistry—Chemistry 110A, 110B, 110C	9
Technical electives	18
At least 2 units must be in upper division chemistry or applied chemistry courses.	
Humanities-social sciences electives	8
Total Units for Upper Division Program	**94**

Chemical Engineering/Materials Science and Engineering

Minimum units required for major: 191.

Subject Areas and Courses	UNITS
Engineering—Engineering 100, 106	7
Chemical engineering—Chemical Engineering 150A, 150B, 151, 152A, 152B, 153, 154A, 154B, 155A, 155B, 156A, 156B, 157, 158, 159, 160	52
Chemistry—Chemistry 110A, 110B, 110C	9
Materials science—Engineering 130, 132, 134, 138, and three courses chosen from Engineering 140, 142, 144, 146, 147	21
Humanities-social sciences electives	8
Total Units for Upper Division Program	**97**

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) Environmental Engineering, (3) Structural Engineering, Structural Mechanics and Geotechnical Engineering, (4) Transportation Planning and Engineering, and (5) Water Resources Engineering. You may specialize in one or more of these areas by selecting appropriate technical electives; such specialization is not re quired. You are urged to consult a faculty adviser when you are ready to develop your program.

Because of the direct concern of professional civil engineers for the quality of human life, civil engineering students are encouraged to include among their technical electives courses such as Economics 125A and 125B, Environmental Studies 160 and 166, Political Science 108, 109, and 186, and Sociology 143. Also of possible interest to majors, in all five areas of specialization, are Applied Science 115 and Engineering 180. Additional information concerning the areas of specialization and suggested courses are given in the following paragraphs.

Civil Engineering Planning: Specialization in this area is directed toward planning of resources utilization and development of projects on an urban or regional scale. Civil engineering planning requires an understanding of the basic principles of engineering, economics, law, planning concepts and techniques, environmental sciences, public administration, and politics. You are encouraged to plan your program early with the aid of a faculty adviser and to complement the suggested technical electives with courses in the humanities and social sciences.

Suggested technical electives:

Agricultural Economics 147, 148, 176
Civil Engineering 137, 143, 146, 152, 153, 160, 161, 162
Economics 125A, 125B, 130, 131
Engineering 106, 118
Environmental Studies 160, 161, 166, 168A, 168B, 178
Geography 106, 155, 162
Geology 134
Political Science 181
Statistics 130A, 130B
Water Science 150

Environmental 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, 125, 158
Bacteriology 102, 130A
Biochemistry and Biophysics 101A, 101B
Chemical Engineering 154A, 154B, 156A, 156B
Chemistry 8A, 107A, 107B, 110A
Civil Engineering 143, 145, 146, 147, 148B, 149A, 149B, 152
Engineering 118, 160
Environmental Studies 150A, 150B, 150C, 151, 166
Statistics 130A, 130B

Structural Engineering, Structural Mechanics, and Geotechnical Engineering: This area is concerned with the conception, design, analysis, economics, and construction of man-made structures such as buildings, bridges, highways, and dams. The principles of structural engineering are applicable to all types of structures and all sources of loadings. Structural mechanics emphasizes the more analytical aspects of structural engineering. Geotechnical engineering emphasizes the application of the principles of soil mechanics to the design or prediction of performance of foundation and earth structures.

Suggested technical electives:

Applied Science 115
Art 121A, 121B, 121C
Civil Engineering 131B, 132A, 132C, 134, 135, 137, 138, 139, 162, 173, 175, 177
Engineering 122, 138, 180
Mathematics 128A, 128B, 128C

Transportation Planning and Engineering: Specialization in this area is concerned with the development, coordination, and management of transportation systems for the movement of people and goods in a manner compatible with societal demands. Transportation planning blends knowledge of the basic concepts of engineering, economics, and planning in the development of policies, programs, and projects. Transportation systems engineering blends knowledge of many engineering disciplines in the design, construction, operation, and maintenance of transportation facilities in the form of an integral system. You are urged to acquire an awareness of the social sciences and environmental sciences through courses in these areas.

Suggested technical electives:

Agricultural Economics 148
Civil Engineering 137, 149A, 149B, 152, 153, 160, 161, 162
Engineering 118, 160
Environmental Studies 168A, 168B, 173, 179

Water Resources Engineering: This area includes hydrology, hydraulics, and water resources systems planning and design. Hydraulics is concerned with flow in pipe and open-channel water-distribution systems and through hydraulic structures. Water resources systems planning and design is concerned with the comprehensive development of water resources for multiple use. Emphasis is placed on principles of planning, analysis and engineering design and operation as related to the water needs of industry, agriculture, recreation, and other activities.

Suggested technical electives:

Agricultural Economics 148, 176
Atmospheric Science 120, 121A, 121B
Civil Engineering 143, 144, 145, 146, 148B, 152, 153
Electrical and Computer Engineering 112, 151
Environmental Studies 128, 150A, 151
Geography 162
Political Science 172
Water Science 103, 110, 150, 160

Civil Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 180.

NOTE: For key to footnote symbols, see page 123.

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100 or 111	3-4†
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 plus any four courses from Civil Engineering 132A, 132C, 134, 139, 144, 145, 146, 148B, 149B, 152, 160, 161, 162, 173	15
Economics—Engineering 106	3
Mathematics electives—select from Mathematics 128A, 128B, 128C; Statistics 130A, 130B, 131A, 131B; Applied Science 115; Engineering 118, 180; Civil Engineering 153	5
Technical electives (Six of these units must be selected from engineering courses.)	13†
Transportation electives‡ selected from Civil Engineering 160, 161, or 162	3
Humanities-social sciences electives	15
Total Units for Upper Division Program	**90**

Civil Engineering/Materials Science and Engineering

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 103A, 104A	9
Applied thermodynamics—Engineering 105A or Chemistry 110A; Engineering 130	6
Structures—Engineering 104B; Civil Engineering 131A	6
Soil mechanics—Civil Engineering 171, 172	5
Hydraulics and water resources—Civil Engineering 141, 141L, 142, 148A	10
Civil engineering design—Civil Engineering 132B, plus any four courses from Civil Engineering 132A, 132C, 134, 139, 144, 145, 146, 148B, 149B, 152, 160, 161, 162, 173	15
Economics—Engineering 106	3
Mathematics electives—select from Mathematics 128A, 128B, 128C; Statistics 130A, 130B, 131A, 131B; Applied Science 115; Engineering 118, 180; Civil Engineering 153	5
Materials science electives—choose four courses from Engineering 132, 134, 138, 140, 142, 144, 146	12
Humanities-social sciences electives	15
Civil Engineering 137 recommended.	
Total Units for Upper Division Program	**90**

Electrical and Computer Engineering

Present-day Electrical and Computer Engineering embraces a broad spectrum of disciplines based on the physical and mathematical sciences. Electrical and Computer Engineering encompasses diverse fields such as automation and control, instrumentation, communications, information processing, micro-miniaturization of integrated circuits, and solid-state electronic devices. Work in these fields is being applied in a variety of industries, communications, including transportation, medicine, education, and business.

The Department of Electrical and Computer Engineering offers four broad major programs: (1) General Electrical Engineering, (2) Electrical Engineering with emphasis on Computers, (3) Electrical Engineering with emphasis on Electronics, Circuits and Signal Processing, and (4) Electrical Engineering with emphasis on Solid-State Microwaves and Quantum Electronics. All four curricula share the same core of required courses in the fundamentals of Electrical and Computer Engineering. The General curriculum provides maximum flexibility for students who want to design their own package of upper-division technical elective courses. For example, a student can plan a program that provides depth in one or more areas of specialization, or as an alternative, a program that provides breadth in the overall field of Electrical and Computer Engineering.

Curricula (2), (3), and (4) listed above are designed to guide students who specifically want emphasis in one of these three general areas. However, students who elect one from these three curricula still have considerable flexibility in the choice of upper-division technical electives. As in the General Electrical Engineering curriculum, this flexibility can be used to obtain either depth in these areas of specialization or breadth.

All four curricula enable students to prepare for careers as practicing engineers or for graduate study in Electrical and Computer Engineering (or both). Close correlation between theory and practice is emphasized in each curriculum, each requires a total of 180 units of credit, and each is described more fully below. The name of the particular curriculum selected will appear on the Student Record (academic transcript).

Electrical Engineering (General): All upper-division, required courses for the General Electrical Engineering curriculum are listed beginning at the end of this section. These requirements include a core of eight courses in the area of electrical and computer engineering: Engineering 100; Electrical and Computer Engineering 110, 111, 112, 130A-130B, 140 and 170; and 30 units of technical electives to be chosen by the student, subject to two constraints:

- at least three units must be from an upper-division Electrical and Computer Engineering course with a laboratory and
- at least 12 units must be from courses included in the area of design.

The core of eight courses, which is common to all four curricula, provides a foundation in electromagnetics, physical electronics, electrical and electronic circuits, and computer structure and language.

A suggested group of technical electives that would provide maximum breadth of exposure to the overall field of electrical and computer engineering is:

Engineering 118
Electrical and Computer Engineering 114A, 114B, 131A, 132A, 145A, 151, 157A, 160, 171, 180

Electrical Engineering (Computers): All upper-division required courses in the Electrical Engineering curriculum, with emphasis on Computers, are listed below. These requirements include the common core of eight courses described under the General Electrical Engineering curriculum above; computer design courses (Electrical and Computer Engineering 171, 180 and three courses to be chosen by the student from the group of computer design electives; 12 units of technical electives; and a 3-unit laboratory course selected from the group of laboratory electives. The specialization courses treat the theory, design; and application of computing systems, and include a variety of areas of sub-specialization such as computer organization, digital systems design, software systems, automata theory, formal languages, and artificial intelligence.

Electrical Engineering (Electronics, Circuits and Signal Processing): All upper-division required courses in the Electrical Engineering curriculum, with emphasis on Electronics, Circuits and Signal Processing, are listed below. These requirements include the common core of eight courses described under the General Electrical Engineering curriculum; five specialization courses (Electrical and Computer Engineering 151, 160 and three courses to be chosen by the student from the group of design technical electives; 15 units of additional technical electives; and a 3-unit laboratory course selected from the group of laboratory electives. The specialization courses treat the theory, design, and application of electronics, circuits, and signal processing systems. They include a variety of areas of subspecialization, such as analog waveform, circuits and systems, sampled data, digital circuits, and systems including solid-state and integrated circuits; control systems, automation, and instrumentation; and communications systems, data transmission, and information processing.

Electrical Engineering (Solid-State, Microwaves and Quantum Electronics): All upper-division required courses in the Electrical Engineering curriculum, with emphasis on Solid-State, Microwaves and Quantum Electronics, are listed below. These requirements include the common core of eight courses described under the General Electrical Engineering curriculum; six specialization courses (Electrical and Computer Engineering 131A, 145A, and four courses to be chosen by the student from the group of design technical electives; 12 units of additional electives; and a 3-unit laboratory course selected from the group of laboratory electives. The specialization courses treat the theory, design and application of solid-state, microwave and quantum electronic devices and systems, including integrated circuit devices, magnetic devices, lasers and superconductivity.

Electrical Engineering/Materials Science and Engineering: In addition to the four standard Electrical Engineering curricula, the Departments of Electrical and Computer Engineering and Mechanical Engineering jointly offer a double major in Electrical Engineering/Materials Science and Engineering. All required upper division courses for this fifth curriculum are listed in the next column. This double major is comprised of 180 units.

Electrical Engineering: General

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Mathematics, upper division mathematics or statistics course (except Statistics 102)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A	6
Circuits, systems and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112	15
Computers—Electrical and Computer Engineering 170	4
Electromagnetic fields and physical electronics—Electrical and Computer Engineering 130A, 130B, 140	10
Laboratory elective—one upper division Electrical and Computer Engineering course with laboratory (except Engineering 100, Electrical and Computer Engineering 111; but may include Electrical and Computer Engineering 199)	3
Design technical electives—select four courses from Electrical and Computer Engineering 114A, 114B, 115A, 115B, 131C, 132A, 132B, 145A, 145B, 145C, 150, 151, 157A, 157B, 160, 161, 165, 171, 172, 175, 176, 177, 180, 181, 182A, 182B, 185, 186, Engineering Computer Science 125	12
Additional technical electives	18
Humanities-social sciences electives	15
Unrestricted elective	1
Total Units for Upper Division Program	**90**

Electrical Engineering: Computers

Minimum units required for major: 180.

Subject Areas and Courses	UNITS

†One unit of Engineering 100 will be applied toward the Technical electives.

‡Students should be aware that Civil Engineering 10 is a required prerequisite to course 162. Units in excess of these count toward civil engineering design above.

NOTE: For key to footnote symbols, see page 123.

Mathematics, upper division mathematics or statistics course (except Statistics 102) 3
Professional responsibilities—Engineering 190 3
Engineering sciences—Engineering 102A, 105A ... 6
Circuits, systems, and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112 15
Computers (design)—Electrical and Computer Engineering 170, 171, 180 12
Electromagnetic fields and physical electronics—Electrical and Computer Engineering 130A, 130B, 140 10
Laboratory elective—one upper division Electrical and Computer Engineering course with laboratory (except Engineering 100. Electrical and Computer Engineering 111; but may include Electrical and Computer Engineering 199) 3
Computers electives—select three courses from Electrical and Computer Engineering 151, 172, 175, 176, 177, 181, 182A, 182B, 185, 186; Engineering Computer Science 125 9
Additional technical electives 12
Humanities-social sciences electives 15
Unrestricted elective 2

Total Units for Upper Division Program 90

Electrical Engineering: Electronics, Circuits and Signal Processing

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Mathematics, upper division mathematics or statistics course (except Statistics 102)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A	6
Circuits, systems and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112, 151, 160	21
Computers—Electrical and Computer Engineering 170	4
Electromagnetic fields and physical electronics—Electrical and Computer Engineering 130A, 130B, 140	10
Laboratory elective—one upper division Electrical and Computer Engineering course with laboratory (except Engineering 100. Electrical and Computer Engineering 111; but may include Electrical and Computer Engineering 199)	3
Electronics circuits and signal processing (design) electives—select three courses from Electrical and Computer Engineering 114A, 114B, 150, 157A, 157B, 161, 165, 172, 176, 177	9
Additional technical electives	15
Humanities-social sciences electives	15
Unrestricted electives	1
Total Units for Upper Division Program	**90**

Electrical Engineering: Solid-State, Microwaves and Quantum Electronics

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Mathematics, upper division mathematics or statistics course (except Statistics 102)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A	6
Circuits, systems and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112	15
Computers—Electrical and Computer Engineering 170	4
Solid-state, microwaves and quantum electronics—Electrical and Computer Engineering 130A, 130B, 131A, 140, 145A	16
Laboratory elective—select from Electrical and Computer Engineering 114A, 114B, 115A, 115B	3
Solid-state, microwaves and quantum electronics (design) electives—select four courses from Electrical and Computer Engineering 114A, 114B, 115A, 115B, 131B, 131C, 132A, 132B, 145B, 145C, 148, 175	12
Additional technical electives (may include courses not used for solid-state, microwaves and quantum electronics, design, electives listed above)	12
Humanities-social sciences electives	15
Unrestricted electives	1
Total Units for Upper Division Program	**90**

Electrical Engineering/Materials Science and Engineering

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Mathematics, upper division mathematics or statistics course (except Statistics 102)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A, 130	9
Laboratory elective—Electrical and Computer Engineering courses with a total of 2 units of laboratory in physical electronics area.	2
Circuits, systems and electronics—Engineering 100, Electrical and Computer Engineering 110, 111, 112	15
Computers—Electrical and Computer Engineering 170	4
Electromagnetic fields and physical electronics—Electrical and Computer Engineering 130A, 130B, 140	10
Design electives—Electrical and Computer Engineering 145A, 145B, 145C	9
Materials science—Engineering 138, 142; and three courses chosen from Engineering 132, 134, 140, 144, 146, and Electrical and Computer Engineering 148	15
Additional design technical electives	3
Technical elective	2
Humanities-social sciences electives	15
Total Units for Upper Division Program	**90**

Division of Engineering Computer Science

In 1983 the new Division of Computer Science was formed in the College of Engineering. It was placed, as an interim measure, within the Department of Electrical and Computer Engineering. The Division has responsibilities for undergraduate majors in both Engineering (Computer Science and Engineering, below) and the College of Letters and Science (Computer Science and Mathematics, see page 164), and with additional duties related to providing introductory computing for undergraduate majors and supervising of graduate degree students in the field.

The faculty of the Division represent most traditional areas of computer science. Immediately following is the Computer Science and Engineering major program.

Computer Science and Engineering: This engineering curriculum has requirements and strengths in engineering and computer fundamentals and architecture and computer software. The curriculum provides background in programming, computer architecture, compilers and operating systems, database and file processing, switching theory, digital design, mathematics, physics, chemistry, engineering, and electives which will allow students to develop strong computer software concentration, with the option of building strong knowledge in computer hardware as well. It has become recognized by industry, by the professional societies and by academicians that development in computer hardware and software go hand-in-hand. Software development is a very costly, time consuming and demanding activity requiring the analytical abilities and problem-solving skills and training common to other engineering disciplines.

Computer Science and Engineering

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Mathematics electives One course each from (1) and (2) below; or one course from (1) or (2) below and one other course for which one of these courses is a substantial prerequisite. (1) Probability, Statistics 131A, Mathematics 131 or Engineering 118 (2) Algebraic structures, Electrical and Computer Engineering 191, Mathematics 139A or 151A	6
Professional responsibilities (Engineering 190)	3
Engineering science (Engineering 102A, 105A)	6
Circuits, systems, electronics (Engineering 100, Electrical and Computer Engineering 112)	8
Computer organization, architecture and hardware (Electrical and Computer Engineering 170, 171, 176)	12
Computer software (Electrical and Computer Engineering 180, 181, 185)	12
Computer electives Select courses from Electrical and Computer Engineering 172, 175, 177, 182A, 182B, 186, 277A, Engineering Computer Science 123, 124, 125	11
Technical electives	14
Humanities-social sciences electives	15
Unrestricted elective	3
Total Units for Upper Division Program	**90**

Materials Science and Engineering

Materials Engineering is directed towards an understanding of the structure, properties, and behavior of materials.

Modern society demands new and improved materials with capabilities far superior to common metals, alloys, and ceramics. New materials are needed for high-speed transportation systems, surgical and dental implants, new generations of power plants, and solid-state electronic devices in computer and communication technology.

The development of new materials and the understanding of present-day materials demand a thorough knowledge of basic engineering and scientific principles including crystal structure, elastic and plastic behavior, thermodynamics, phase equilibria and reaction rates, and physical and chemical behavior of engineering materials.

The undergraduate program in materials science and engineering provides you with the background for activities in research, processing, and the design of materials. The services of materials engineers are required in many different engineering operations, from fracture behavior in automobiles to fatigue behavior in aircraft frames, from corrosion behavior in petro-chemical refineries to radiation-induced damage in nuclear power plants, and from fabrication of steel to design of semiconductors.

Materials engineers are also increasingly involved in developing the new materials needed to attain higher efficiencies in existing and proposed energy conversion schemes.

The Materials Science and Engineering curriculum is based on a common core of courses that is basic to engineering. These courses, taken during your first two years, provide you with a strong foundation in fundamental engineering concepts. Your third and fourth years are primarily devoted to studying subjects in the materials sciences. Recommended to be taken during the junior year is a set of "fundamentals" courses (Engineering 130, 132, 134, 138). With this background in hand, you are then ready for the "applications" courses (Engineering 140, 142, 144, 146) which are recommended for the senior year.

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.

Twenty-four 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.

NOTE: For key to footnote symbols, see page 123.

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 guide lines to assist you and your adviser in the preparation of study lists. You may elect to take courses from a number of these areas of specialization, or you may wish to concentrate on one or two areas.

Suggested technical electives:

Automatic Control and Systems Analysis:
Mechanical Engineering 155, 171, 172
Electrical and Computer Engineering 150, 157A, 157B
Engineering 118

Biomedical Engineering:

Chemistry 107A, 107B
Biological Sciences 1
Zoology 2
Physiology 111A, 111B, 112, 113
Physical Education 101, 102

Chemical Corrosion:

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

Computers:

Applied Science 115
Computer Science Engineering 123
Electrical and Computer Engineering 171, 172, 175, 176, 177, 180, 181, 182A, 182B
Mathematics 128A, 128B, 168
Statistics 130A, 130B

Electronic Materials:

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

Environmental Engineering:

Engineering 160
Atmospheric Science 120, 125
Biochemistry and Biophysics 101A, 101B
Water Science 41
Chemistry 8A, 8B
Civil Engineering 149A, 149B

Heat Transfer:

Engineering 105B
Mechanical Engineering 165
Chemical Engineering 150A, 153

Materials Design and Processing:

Engineering 104B, 106
Mechanical Engineering 150A, 150B, 151, 152, 155
Civil Engineering 137

Physics of Solids:

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

Suggested advisers:

D. G. Howitt, A. K. Mukherjee, Z. A. Munir, J. F. Shackelford.

Materials Science and Engineering

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 103A, 104A	9
Applied thermodynamics—Engineering 105A, 130	6
Materials in design—Engineering 140	3
Measurements and laboratory—Engineering 146; Mechanical Engineering 124, 176	8
Materials science—Engineering 132, 134, 138, 142, 144, 147	18
Applied mathematics—Engineering 180	3
Technical electives	24
Humanities-social sciences electives	15
Total Units for Upper Division Program	**90**

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.

Creative Design: The creation and improvement of products, processes, or systems which are mechanical in nature are the primary goals of a professional mechanical engineer. This is a challenge now more than ever, because the solutions to such major social concerns as environmental pollution, mass transportation, raw material shortages, and energy concerns will depend heavily on the engineer's ability to create new types of machinery and mechanical systems.

The engineer-designer must have a solid and relatively broad background in the basic physical and engineering sciences and have the ability to organize and solve a variety of problems. In addition to having technical competence, the designer must be able to consider the socioeconomic consequences of the design and its possible impact on the environment. Product safety, reliability, and economics are other considerations.

Suggested technical electives:

Mechanical Engineering 124, 130, 134, 150B, 151, 152, 155, 162, 166, 172
Applied Science 115
Civil Engineering 131A, 132A
Agricultural Engineering 119, 133, 134, 170A, 170B
Engineering 111, 118, 122, 140, 142, 160

Suggested advisers:

C. W. Beadle, J. M. Henderson, M. L. Hull, A. T. Yang

Energy Systems: This area is specifically designed for those who would like to work in the fields of power generation, propulsion for transportation, and energy conversion. It is in these fields that the increased efficiency of systems and the impact of potential environmental pollution are assuming more importance in the design stage.

The program of study is based on the fundamentals of fluid mechanics, thermodynamics, and heat transfer. These fundamentals are applied to such diverse topics as combustion engines, gas turbines, heat exchangers, nuclear reactors, MHD power generators, solar energy systems, and others.

Suggested technical electives:

Engineering 160
Mechanical Engineering 161, 162, 166

Suggested advisers:

J. W. Baughn, H. Brandt, H. A. Dwyer, M. A. Hoffman, W. Kollmann, A. A. McKillop

Systems Dynamics and Control: Modern engineers are increasingly concerned with the performance of integrated dynamics systems in which it is not possible to optimize component parts without considering the overall system.

Systems Dynamics and Control is concerned with the modeling, analysis, and simulation of all types of dynamic systems and with the use of automatic control techniques to change the dynamic characteristics of systems in useful ways. The emphasis in this program is on the physical systems that are closely related to mechanical engineering, but the techniques for studying these systems apply equally well to social, economic, and other dynamic systems.

Suggested technical electives:

Mechanical Engineering 124, 128, 129, 134, 152, 172
Electrical and Computer Engineering 112, 151
Engineering 122, 140, 160

Suggested Advisers:

J. W. Brewer, M. Hubbard, D. C. Karnopp, D. L. Margolis

Transportation Systems: An important aspect of Mechanical Engineering has traditionally involved the planning, design, and operation of transportation systems. As society recognizes the increasing importance of optimizing transportation systems to minimize environmental degradation and energy expenditure, engineers will need to consider major innovations in the way people and goods are moved. This will require competence in vehicle dynamics, propulsion, and control, and an understanding of the problems caused by present-day modes of transportation.

Suggested technical electives:

Engineering 122, 160
Mechanical Engineering 124, 127, 128, 129, 134, 152, 161, 162, 172
Civil Engineering 131A, 149A, 149B, 160

Suggested advisers:

M. Hubbard, D. C. Karnopp, D. L. Margolis

Mechanical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics—Engineering 105A, 105B; Mechanical Engineering 165	9
Fluid mechanics—Engineering 103A, 103B	6
Mechanical design—Mechanical Engineering 150A, and 150B or 166	7
Controls and systems analysis—Mechanical Engineering 171	4
Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176	6
Professional responsibilities—Engineering 190	3
Applied mathematics—Engineering 180	3
Technical electives	21

Choose 12 of the 21 units from upper division Engineering or Mechanical Engineering courses. In order to satisfy engineering design requirements, three courses must be selected from Engineering 122, 140, Mechanical Engineering 150B or 166 (whichever is not chosen above), 124, 130, 134, 151, 152, 155, 162, 172.

NOTE: For key to footnote symbols, see page 123.

Humanities-social sciences electives 15

Total Units for Upper Division Program 90

Mechanical Engineering/Materials Science and Engineering

Minimum units required for major: 180.

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics—Engineering 105A, 105B, 130; Mechanical Engineering 165	12
Fluid mechanics—Engineering 103A, 103B	6
Mechanical design—Engineering 140, Mechanical Engineering 150A	7
Controls and systems analysis—Mechanical Engineering 171	4
Materials science—Engineering 132, 134, 138, and one course from Engineering 142, 144, 146	12
Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176	6
Applied mathematics—Engineering 180	3
Professional responsibilities—Engineering 190	3
Technical electives Two courses must be chosen from Mechanical Engineering 124, 130, 134, 150B, 152, 155, 172. (Mechanical Engineering 124 is strongly recommended.)	4
Humanities-social sciences electives	15
Unrestricted electives	2

Total Units for Upper Division Program 90

Individual (Engineering) Major

Minimum units required for major: 180.

An engineering student who has a definite career objective that is not compatible with one of the named curricula may propose an Individual engineering major. (See page 234.)

Courses in Engineering

Lower Division Courses

3. Introduction to Engineering Systems (3) I, II. The Staff (Orlob in charge)
Lecture—2 hours; laboratory—3 hours. Prerequisite: algebra and trigonometry recommended. An introduction to the engineering profession. A general view of the engineering process as obtained by participation in laboratory experiments illustrative of the solution of representative, but greatly simplified, engineering problems. (P/NP grading only.)

4. Engineering Graphics in Design (3) I, II. Henderson, Kemper
Lecture—2 hours; laboratory—3 hours. Principles of descriptive geometry and of mechanical and free-hand drawing; their application in the representation, visualization, and solution of engineering problems. Computer-aided graphics. Introduction to engineering design.

5. Applications of Computers (3) II, III. The Staff (Chairperson in charge)
Laboratory—3 hours; lecture—2 hours. Prerequisite: Mathematics 16A or 21A. Introduction to digital computation and computer programming. Algorithms and their description. Basic programming, debugging of programs. Problems in approximate computing accuracy and significance. Practice with an algebraic language (FORTRAN) in solving simple numerical and nonnumerical problems. Students who have had Engineering 5ATA, Computer Science Engineering 8, 80, or 88 may not receive credit for Engineering 5; and those who have had Computer Science Engineering 20 may receive only 2 units of credit.

5ATA. Self-Paced Introduction to Computer Programming: FORTRAN 77 (2) I, II, III. The Staff
Workshop—6 hours. Prerequisite: Mathematics 16A or 21A. First of a two-part self-paced introductory programming sequence teaching FORTRAN 77 with emphasis on problem solving. Topics covered include algorithm design, programming techniques and program debugging. Students who have had Engineering 5, Computer Science Engineering 8, 80, or 88 may not receive credit for Engineering 5ATA; and those who have had Computer Science Engineering 20 may receive only 1 unit of credit.

5ATB. Self-Paced Introduction to Computer Programming: FORTRAN 77 (1) I, II, III. The Staff
Workshop—3 hours. Prerequisite: course 5ATA (may be taken concurrently). Sequel to course 5ATA. Self-paced continuation of the introduction to computer programming teaching FORTRAN 77 with emphasis on problem solving. Topics covered include character and array data handling. Students who have had Engineering 5, Computer Science Engineering 8, 80, or 88 may not receive credit for Engineering 5ATB.

17. Circuits (3) I, II, III. The Staff (Ford in charge)
Lecture—3 hours. Prerequisite: Mathematics 22B (may be taken concurrently); Physics 8B. Basic electric circuit analysis techniques, including: electrical quantities and elements, resistive circuits, transient and steady-state responses of RLC circuits, sinusoidal excitation and phasors, and complex frequency and network functions.

20. The Technological World (3) III. Kemper
Lecture—3 hours. Prerequisite: high school algebra. The nature of technology; computers and automation; energy systems; engineering design, analysis, and problem solving; metric system; patents and creativity. Technology and social change; technology assessment and technological choice. Intended primarily for students who are not engineering or science majors. Engineering or physical science students may receive only 2 units of credit.

35. Statics (3) I, II, III. The Staff (Orlob in charge)
Lecture—3 hours. Prerequisite: Mathematics 22C (may be taken concurrently); Physics 8A. Force systems and equilibrium conditions with emphasis on engineering problems.

45. Properties of Materials (4) I, II, III. The Staff (Munir in charge)
Lecture—3 hours; laboratory—3 hours. Prerequisite: sophomore student in Engineering. Introductory course on the properties of engineering materials and their relation to the internal structure of materials.

Upper Division Courses

100. Electronic Circuits and Systems (4) I, II. The Staff (Chairperson in charge)
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 17. Introduction to theory and application of analog and digital circuits and systems. It is strongly recommended that students enroll in this course as soon as possible after completing Engineering 17.

102A. Dynamics (3) I, II, III. The Staff (Beadle in charge)
Lecture—3 hours. Prerequisite: course 35; Mathematics 22B, 22C. Kinematics and kinetics of particles, of systems of particles, and of rigid bodies applied to engineering problems.

102B. Dynamics (3) II, III. The Staff (Beadle in charge)
Lecture—3 hours. Prerequisite: course 102A. Topics in rigid body dynamics; elementary dynamics of vibrating systems; introduction to energy methods.

102L. Dynamics Laboratory (1) II. The Staff (Beadle in charge)
Laboratory—3 hours. Prerequisite: course 102B (may be taken concurrently). Experimental laboratory to demonstrate fundamental principles of dynamics and their application to engineering problems. Introduction to instrumentation for dynamic motion measurement.

103A. Elementary Fluid Mechanics (3) I, II, III. The Staff (Dwyer in charge)
Lecture—3 hours. Prerequisite: course 102A (may be taken concurrently). Fluid properties; fluid statics; continuity and linear momentum equations for control volumes; flow of incompressible fluids in pipes; dimensional analysis.

103B. Elementary Fluid Mechanics (3) II, III. Dwyer, White
Lecture—3 hours. Prerequisite: course 103A. Incompressible viscous flow; boundary layer flow; one-dimensional compressible flow; fluid measurements; applications.

103L. Fluid Mechanics Laboratory (1) II, III. Migliore, Law
Lecture—1 hour, discussion—1 hour, and laboratory—1½ hours. (alternate weeks with course 105L). Prerequisite: course 103B (may be taken concurrently). Basic principles and devices which are common in fluid mechanics are illustrated with a series of experimental demonstrations. Experiments are concerned with flow, pressure and viscosity measurement. (P/NP grading only.) Students who have had Civil Engineering 141L may not receive credit for this course.

104A. Mechanics of Materials (3) I, II. The Staff (Orlob in charge)
Lecture—3 hours. Prerequisite: course 35; Mathematics 22B. Uniaxial loading and deformation; general concepts of stress-strain-temperature relations and yield criteria; stresses in thin-walled pressure vessels; torsion of shafts; bending of symmetrical beams.

104B. Mechanics of Materials (3) II, III. The Staff (Orlob in charge)
Lecture—3 hours. Prerequisite: course 104A. Deflections due to bending of beams, unsymmetrical bending; application of energy methods to bending problems; yielding and plastic deformation in beams, limit analysis; buckling of columns.

105A. Thermodynamics (3) I, II, III. The Staff (Beadle in charge)
Lecture—3 hours. Prerequisite: Mathematics 22B and 22C. Fundamental concepts of thermodynamics, heat and the first law, thermal properties of gases, application of first law, cycles and the second law, reversibility, Carnot cycle and Kelvin temperature scale, entropy, thermodynamic diagrams, steam tables, and applications of thermodynamics to engineering systems.

105B. Thermodynamics (3) II, III. The Staff (Beadle in charge)
Lecture—3 hours. Prerequisite: course 105A. Review of first and second laws, review of power cycles, thermodynamic relations, gas and vapor mixtures, real gases, reactive processes of pure substances, phase and chemical equilibrium, and thermodynamics and statistical mechanics.

105L. Thermodynamics Laboratory (1) II, III. Baughn
Lecture—1 hour, discussion—1 hour, and laboratory—1½ hours (alternate weeks with course 103L). 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.(P/NP grading only.)

106. Engineering Economics (3) II, III. Singh, Jenkins
Lecture—3 hours. Prerequisite: upper division standing in Engineering. The analysis of problems in engineering economy; the selection of alternatives; replacement decisions. Compounding, tax, origins and cost of capital, economic life, and risk and uncertainty are applied to methods of selecting most economic alternatives.

111. Electric Power Equipment (3) I, III. Chancellor
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 17. Principles of AC and DC electric motors and solenoids, their control systems and power sources. Selection of electric power equipment components based on their construction features and performance characteristics.

118. Probabilistic Systems Analysis (3) I. Kitamura, Lam
Lecture—3 hours. Prerequisite: Mathematics 21C. Probabilistic models and concepts in engineering. Introductory probability and statistics for engineers and scientists.

122. Introduction to Mechanical Vibrations (3) I. Hull
Lecture—3 hours. Prerequisite: course 102B. Free and forced vibrations in lumped-parameter systems with and without damping; vibrations in coupled systems; electromechanical analogs; use of energy conservation principles.

130. Thermodynamics of Materials Processes (3) I, Mukherjee
Lecture—3 hours. Prerequisite: courses 45 and 105A (or the equivalent); upper division standing in Engineering. Application of the principles of thermodynamics to solid engineering materials with emphasis on solving problems associated with materials processes, e.g., alloying, phase stability, surface properties, semiconduction, thermoelectric power and thermionic energy conversion.

132. Structure of Engineering Materials (3) I, Gibeling
Lecture—3 hours. Prerequisite: course 45; upper division standing. Structure of engineering materials on the atomic scale will be described by exploring the fundamentals of crystallography. The importance of this structure to materials' properties will be emphasized. Experimental determination of structure will be described using x-ray diffraction techniques.

134. Fundamentals of Rate Processes in Materials Science (3) III. Gibeling
Lecture—3 hours. Prerequisite: courses 45 and 105A or 130. Basic kinetic laws. Theory of Absolute Reaction Rates. Applications in diffusion, nucleation, solidification, evaporation, and sintering processes.

138. Mechanical Behavior of Materials (3) II. Mukherjee
Lecture—3 hours. Prerequisite: courses 45 and 105A (or the equivalent); upper division standing in Engineering. Microscopic aspects of the mechanical behavior of engineering materials are discussed with emphasis on recent developments in materials science and fracture mechanics. High temperature plastic deformation processes, strengthening mechanisms and mechanical failure modes of materials systems are outlined.

140. Materials in Engineering Design (3) III. The Staff
Lecture—3 hours. Prerequisite: senior standing in Engineering or consent of instructor. Descriptive treatment of common engineering materials. Discussion of design parameters of typical materals including metals, ceramics, glasses, polymers, and composites. Principles of heat treatment and fabrication as they affect design parameters and applications in engineering will be emphasized.

142. Principles of Nondestructive Testing (3) II. Shackelford
Lecture—3 hours. Prerequisite: senior standing in Engineering or consent of instructor. Basic principles of nondestructive testing using radiological, ultrasonic, electrical, magnetic, penetrant methods, etc., are discussed. Typical results expected from these tests and their application in material characterization, flaw detection, crystallographic information, chemical inhomogeneity, residual stress analysis, etc., are emphasized.

NOTE: For key to footnote symbols, see page 123.

144. Corrosion and Oxidation of Engineering Materials (3) I, Munir
Lecture—3 hours. Prerequisite: upper division standing in Engineering. Principles governing the interaction between engineering materials and their environment; corrosion in aqueous media, soils and biological systems. Oxidation of structural materials in high temperature applications; design and selection criteria for the prevention and control of corrosion.

146. Materials Laboratory (3) II. The Staff
Laboratory—8 hours. Prerequisite: enrollment open only to majors or double majors in Materials Science and Engineering; course 45 recommended. Investigation of materials behavior and understanding of this in relation to fundamental principles of materials science will be emphasized.

147. Principles of Polymer Materials Science (3) III. Needles, Zeronian
Lecture—3 hours. Prerequisite: chemistry through organic or course 45; introductory physics sequence. Basic principles of polymer science presented including polymer structure and synthesis; polymerization mechanisms, polymer classes, properties, and reactions; polymer morphology, rheology, and characterization; polymer processing. (Same course as Textiles and Clothing 100.)

160. Energy, Society, and the Environment (4) I, Craig
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 (4) III. Craig
Lecture—3 hours; discussion—1 hour. Prerequisite: course 105A or consent of instructor. Technical oveview of energy technologies. Emphasis on semiquantitative understanding. About 20 percent of course is policy oriented. Designed to mesh with course 160, which is primarily policy. (P/NP grading only.)

180. Engineering Analysis (3) I, III. Hubbard, 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. Kemper
Lecture—3 hours. Prerequisite: upper division standing. Organization of the engineering profession; engineering and management; introduction to contracts, specifications, and business law; technical writing; oral presentations on the interactions between engineering and society.

Graduate Course

291. Seminar in Teaching (1) III. Henderson, Baughn
Seminar—1 hour. Discussion of previous experience as a student and actual practice as a teacher. (S/U grading only.)

Engineering: Agricultural

(College of Engineering)

Roger E. Garrett, Ph.D., Chairperson of the Department

Department Office, 2030 Bainer Hall (752-0102)

Faculty

Norman B. Akesson, M.S., Professor
Roy Bainer, M.S., LL.D., Professor Emeritus
Robert H. Burgy, M.S., Professor
William J. Chancellor, Ph.D., Professor
Pictiaw (Paul) Chen, Ph.D., Professor
Roger E. Garrett, Ph.D., Professor
John R. Goss, M.S., Professor
Delbert W. Henderson, Ph.D., Professor
S. Milton Henderson, M.S., Sc.D., Professor Emeritus
David J. Hills, Ph.D., Associate Professor
Bryan M. Jenkins, Ph.D., Assistant Professor
M. Stephen Kaminaka, Ph.D., Assistant Professor
Robert A. Kepner, B.S., Professor Emeritus
Coby Lorenzen, Jr., M.S., Professor Emeritus
Miguel A. Marinō, Ph.D., Professor
R. Larry Merson, Ph.D., Professor
John A. Miles, Ph.D., Associate Professor
Stanton R. Morrison, Ph.D., Professor
Loren W. Neubauer, Ph.D., Professor Emeritus
Michael O'Brien, Ph.D., Professor
Hugo Patiño, Ph.D., Assistant Professor
William O. Pruitt, M.S., Lecturer
Thomas R. Rumsey, Ph.D., Assistant Professor
Verne H. Scott, Ph.D., Professor
R. Paul Singh, Ph.D., Professor
Henry E. Studer, M.S., Professor
Shrinivasa K. Upadhyaya, Ph.D., Assistant Professor
Wesley W. Wallender, Ph.D., Assistant Professor
Wesley E. Yates, M.S., Professor

Courses in Engineering: Agricultural

Lower Division Courses

1. Introduction to Agricultural Engineering (1) II. Garrett
Lecture—1 hour. Introduction to the types of problems addressed by agricultural engineers. Selected problems in field machinery design and management, irrigation, agricultural structures, properties of agricultural materials, and waste management. Review of employment opportunities.

2. Introduction to Forest Engineering (1) III. Miles
Discussion-laboratory—3 hours. Introduction to the engineering aspects of forestry problems, including nursery operations, reforestation, harvesting, log transport, milling and residue utilization. (P/NP grading only.)

92. Internship in Agricultural Engineering (1-5) I, II, III. The Staff (Garrett in charge)
Work-learn experience. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work-study experience in agricultural engineering. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Garrett in charge)
Prerequisite: consent of instructor. Group study of selected topics; restricted to lower division students. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

Upper Division Courses

112. Engines for Agriculture, Industry and Transportation (4) II. Jenkins
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 5 or knowledge of computer programming; Engineering 105A. Design and performance characteristics of combustion engines. Engineering comparison of alternative power units with conventional engines. Selection criteria for engines used in agriculture, industry, and transportation.

114. Principles of Field Machinery Design (3) III. Studer
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 102A. Functional requirements and basic operating principles of field machines; elements of field machinery design; use of instrumentation and computer techniques for analysis of specific machines.

115. Forest Engineering (3) II. Miles
Lecture—3 hours. Prerequisite: Civil Engineering 10, Engineering 102A and 104A; Forestry 100A, 100B, 100C (Berkeley campus) strongly recommended. Applications of engineering principles to problems in the forest industry, including consideration of nursery operations, reforestation, harvesting, road layout, log transport and milling operations.

116. Forest Engineering Field Problems (2) III. Miles
Lecture—1 hour; three weekend field trips to Blodgett Forest. Prerequisite: course 114 or 115. A field study and critical analysis of operations, techniques, and equipment common in forest management, with particular consideration to measurements, data analysis, safety of operations, and maintenance practices.

***117. Stability and Traction of Off-Road Vehicles** (2) I, Chen
Lecture—2 hours. Prerequisite: Engineering 102A and 104A. Drive train elements, suspensions, tires, tracks, chassis configuration and steering system mechanics for heavy-duty vehicles. Performance, stability and traction during pulling, turning and transport. Vehicle interactions with off-road terrain conditions.

119. Hydraulic and Pneumatic Systems (3) III. Upadhyaya
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 103A. Design of hydraulic and pneumatic systems for powering, sensing and controlling machine functions. Characteristics of pumps, motors, control valves, fluidic devices, servo-mechanisms, and hydraulic fluid. Testing of component and system performance.

125. Agricultural Structures: Environmental Aspects (3) I, Morrison
Lecture—3 hours. Prerequisite: Engineering 105A. Fundamentals of heat transfer, solar radiation, psychrometrics, ventilation, animal energetics, lighting with respect to plant growth, atmospheric properties with respect to storage of agricultural products. Application of this information to the design of animal and plant production and product storage structures.

133. Mechanical Unit Operations and Processes (3) II. Rumsey
Lecture—2 hours; laboratory—2 hours. Prerequisite: Engineering 103A. Mechanical unit operations applied to such processes as non-Newtonian flow, size reduction, sorting and mixing of granular materials, materials handling, storage, plant layout, work efficiency, etc.

134. Thermal Unit Operations and Processes (3) III. Singh
Lecture—2 hours; laboratory—2 hours. Prerequisite: Engineering 105A. Thermal unit operations related to drying, refrigeration, freezing, cold storage, evaporation, boiling, distillation, etc.

140. Seepage and Drainage (3) III. Nielsen
Lecture—3 hours. Prerequisite: Engineering 103A or Water Science 142. Flow through porous media; measurement of hydraulic conductivity; seepage under hydraulic structures; anisotrophy flow nets; drainage design for water table and salt control. (Same course as Water Science 140.)

141. Sprinkle and Trickle Irrigation System Design (3) II. Wallender
Lecture—3 hours; Prerequisite: Engineering 103A, Water Science 110 and 111; Engineering 5 or consent of instructor. Analysis and design of sprinkle and trickle irrigation systems using physical, biological and economic principles. Computer-aided design is introduced.

165. Microcomputer Applications in Agriculture (4) I, Kaminaka
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 100 and consent of instructor. Applications of microcomputers. Computer organization and programming. Interfacing a single board computer with transducers and external devices such as relays and DC motors.

170A. Engineering Projects: The Design and Evaluation process (2) I, Miles
Lecture—1 hour; laboratory—3 hours. Prerequisite: two courses from the following (one may be taken concurrently)—courses 114, 115, 125, 133, Civil Engineering 145, Mechanical Engineering 150A, Water Science 16J. Principles and procedures for project design and evaluation with emphasis on agricultural and forestry projects. Project selection, data sources, agricultural and forestry factors, specifications, failure modes, human factors, safety, test design, measurement techniques. Develop proposals for course 170B.

170B. Engineering Design Projects for Agriculture and Forestry (3) II. Studer
Laboratory-discussion—three 2-hour sessions. Prerequisite: course 170A. Individual or group projects involving the design of devices, structures, or systems to solve specific problems in agriculture or forestry. Students may select their projects, subject to approval of instructor.

170C. Testing and Evaluation of Engineering Designs (3) III. Miles
Laboratory—three 3-hour sessions. Prerequisite: course 170B strongly recommended. Individual or group projects involving fabrication, assembly and testing of components, devices, structures or systems designed to solve specific problems in agriculture or forestry. Projects selected by the instructor from those designed in course 170B.

192. Internship in Agricultural Engineering (1-5) I, II, III. The Staff (Garrett in charge)
Work-learn experience. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work-study experience in agricultural engineering. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Garrett in charge)
(P/NP grading only.)

Graduate Courses

215. Soil-Machine Relations in Tillage and Traction (3) I, Chancellor
Lecture—3 hours. Prerequisite: course 114 or 117. Mechanics of interactions between agricultural soils and tillage and traction devices; determination of relevant physical properties of soil; analyses of stress and strains in soil due to machine applied loads; experimental and analytical methods for synthesizing characteristics of overall systems.

NOTE: For key to footnote symbols, see page 123.

235. Advanced Unit Operations in Process and Food Engineering (3) III. Rumsey
Lecture—3 hours. Prerequisite: an upper division course in process or food engineering. Basic procedures applicable to process and food engineering. Heat and mass transfer applications to drying, dehydration and freezing; flow of food and semi-fluid materials; size reduction; respiration of bio-materials.

242. Hydraulics of Surface Irrigation (3) III. Wallender
Lecture—3 hours. Prerequisite: a course in differential and integral calculus; a course in hydraulics or fluid mechanics including some open-channel flow; a course in irrigation principles. Mathematical models of surface-irrigation systems for prediction of the ultimate disposition of water flowing onto a field. Quantity of runoff and distribution of infiltrated water over field length as a function of slope, roughness, infiltration and inflow rates.

245. Agricultural Wastes Management (3) II. Hills
Lecture—2 hours; discussion-laboratory—1 hour. Prerequisite: consent of instructor. Animal, crop and food processing wastes; pesticides, fertilizers, odors, dust and smoke in relation to environmental pollution. Disposal needs, present and future. Regulation, economics and public concern; coordination with municipal and industrial wastes management.

250. Design of Mechanical Systems (2) II. Goss
Lecture—2 hours. Prerequisite: mechanical design and economics recommended. Experience with design; evaluating design concepts and establishing design criteria; analysis and synthesis in design; optimization techniques; human factors in design.

265. Design and Analysis of Engineering Experiments (4) II. Patiño
Lecture—3 hours; laboratory—3 hours. Prerequisite: at least one undergraduate course in statistics or consent of instructor. Design, management, and analysis of engineering experiments with emphasis on criteria for the selection and utilization of statistical methods. Problems necessitating the use of campus and departmental computing facilities will be assigned.

***275. Physical Properties of Agricultural Materials** (3) I, Chen
Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Selected topics on physical properties, such as mechanical, optical, rheological, and aerodynamic properties, as related to the design of harvesting, handling, sorting, and processing equipment. Techniques for measuring and recording physical properties of agricultural materials.

289A-D. Selected Topics in Agricultural Engineering (1-5) I, II, III. The Staff (Garrett in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Directed group study of selected topics with separate sections: **(A)** Simulation of Food Processing Systems; **(B)** Thermal Process Design; **(C)** Fermentation Engineering; **(D)** Alternate Energy Systems.

290. Seminar (1) II, III. The Staff (Goss in charge)
Seminar—1 hour. (S/U grading only.)

297. Advances in Food Engineering (1) I, II, III. Singh
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in food engineering. Presentations by individual students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Garrett in charge)

299. Research (1-12) I, II, III. The Staff (Studer in charge) (S/U grading only.)

Engineering: Applied Science

(College of Engineering)

Frederick O. Wooten, Ph.D., Chairperson of the Department

Department Office, 228 Walker Hall (752-0360)

Faculty

Roger E. Anderson, Ph.D., Lecturer
Meera M. Blattner, Ph.D., Associate Professor
Stewart D. Bloom, Ph.D., Professor
Paul P. Craig, Ph.D., Professor
John S. DeGroot, Ph.D., Professor
John G. Fletcher, Ph.D., Lecturer
John C. Garrison, Ph.D., Lecturer
Abraham Goldberg, Ph.D., Adjunct Professor
Michael W. Guinan, Ph.D., Lecturer
Roger A. Haas, Ph.D., Professor
William G. Hoover, Ph.D., Professor
Lawrence F. Jelsma, Ph.D., Adjunct Lecturer
Rowland R. Johnson, Ph.D., Adjunct Lecturer
John Killeen, Ph.D., Professor
William L. Kruer, Ph.D., Lecturer
Nelson Max, Ph.D., Lecturer
George A. Michael, B.S., Lecturer
Fred P. Milanovich, Ph.D., Lecturer
Arthur A. Mirin, Ph.D., Lecturer
Danny M. Nessett, Ph.D., Lecturer
William A. Newcomb, Ph.D., Adjunct Professor
Richard F. Post, Ph.D., Professor in Residence
Garry Rodrique, Ph.D., Lecturer
Leonard C. Rosen, Ph.D., Adjunct Lecturer
Mordicai Rosen, Ph.D., Lecturer
Aleksei I. Shestakov, Ph.D., Adjunct Lecturer
Stephen K. Skedzielewski, Ph.D., Lecturer
Thomas R. Slezak, Ph.D., Adjunct Lecturer
S. Diane Smith, Ph.D., Adjunct Lecturer
Arthur Sorkin, Ph.D., Lecturer
Wilson K. Talley, Ph.D., Professor
C. Bruce Tarter, Ph.D., Lecturer
Edward Teller, Ph.D., University Professor Emeritus
Richard W. Watson, Ph.D., Lecturer
Frederick O. Wooten, Ph.D., Professor
Yin Yeh, Ph.D., Professor
Mary E. Zosel, Ph.D., Lecturer

Courses in Engineering: Applied Science

Davis

Lower Division Courses

37. Physics of Nuclear Arms Effects and Control (1) II. Jungerman (Physics), Craig
Lecture-discussion—1 hour. Prerequisite: high school algebra. Students who have had any other physics course must have departmental approval before enrolling. Intended for students in letters who are enrolled in course 137 (concurrently). Course will emphasize the physics concepts of course 137. (Same course as Physics 37.)

98. Directed Group Study (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor. Restricted to lower division students. Group study of selected topics. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

115. Introduction to Numerical Methods for Computers (3) I, II, III. The Staff (Wooten in charge)
Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems.

135. Introductory Nuclear Science and Technology (3) I, Craig
Lecture—3 hours. Prerequisite: Physics 121 or the equivalent. Introductory aspects of nuclear phenomena, nuclear masses, size, energy, and decay modes. Interaction of particles and electromagnetic radiation with matter. Instrumentation and theory of measurements; neutron technology. Nuclear chemistry.

137. Science and Technology of Nuclear Arms Effects and Control (3) II. Jungerman (Physics), Craig
Lecture—3 hours. Prerequisite: upper division standing; one course from Physics 1B, 2C, 8D, 10 or Physics 37/course 37 (may be taken concurrently). Scientific and technical aspects of nuclear arms effects and nuclear arms control including the nuclear physics of atomic and hydrogen bombs, blast and radiation effects, radioactivity, electromagnetic pulse, ICBM accuracy, laser weapons, verification safeguards, biological and ecological effects. Emphasis on order of magnitude calculations. Only 1 unit toward technical-electives credit for engineering students. (Same course as Physics 137.)

165A. Quantum Optics I (3) II. Yeh
Lecture—3 hours. Prerequisite: Physics 110A-110B or the equivalent. Quantum nature of light and matter. Statistics of photons in chaotic, coherent and mixed states. Concepts of photon coherence and correlation. Development of a coherent state from a chaotic photon distribution.

165B. Quantum Optics II (3) III. Yeh
Lecture—3 hours. Prerequisite: course 165A or the equivalent. Quantum nature of interaction between light and matter: photoelectric counting statistics. Photon distributions in scattering processes and in nonlinear optical processes.

166A. Quantum Optics Laboratory (1) II. Yeh
Laboratory—3 hours. Prerequisite: course 165A concurrently. On hand experience in working with lasers, photon spectroscopy, electro-optical devices and photoelectric counting statistics.

166B. Quantum Optics Laboratory (1) III. Yeh
Laboratory—3 hours. Prerequisite: course 165B concurrently. Continuation of course 166A.

198. Group Study (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor. Group study of selected topics. Students may enroll in one or more separate sections. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

210A-210B. Advanced Methods of Computational Physics (3-3) II-III. Killeen
Lecture—3 hours. Prerequisite: course 209 or Mathematics 228A-228B or the equivalent. Computational methods in various fields including: hydrodynamics, plasma physics, magnetohydrodynamics, Vlasov and Fokker-Planck equations, particle codes, neutron and radiation transport, chemical kinetics, and atmospheric modeling.

228A-228B-228C. Properties of Matter (3-3-3) I-II-III. Hoover
Lecture—3 hours. Prerequisite: Mathematics 22B and Physics 112B. Microscopic and macroscopic descriptions of matter; thermodynamics and kinetics; constitutive, electrical, mechanical and thermal properties.

230A-230B-230C. Structure of Matter (3-3-3) I-II-III. Yeh
Lecture—3 hours. Prerequisite: course 205C. Classical properties of matter; introduction of quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules and solids; quantum theory of cooperative effects.

234A-234B-234C. Electromagnetic Theory (3-3-3) I-II-III. DeGroot
Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 131B. 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.

280A-280B-280C. Plasma Physics and Controlled Fusion (3-3-3) I-II-III. DeGroot
Lecture—3 hours. Prerequisite: course 234B or consent of instructor. Equilibrium plasma properties; single particle motion; fluid equations; waves and instabilities in a fluid plasma; plasma kinetic theory and transport coefficients; linear and nonlinear Vlasov theory; fluctuations, correlations and radiation; inertial and magnetic confinement systems in controlled fusion.

285A-285B-285C. Advanced Plasma Physics (3-3-3) I-II-III. Post
Lecture—3 hours. Prerequisite: courses 280A-280B-280C. Plasma kinetic theory; applications of the Fokker-Planck equation; advanced instability theory. Practical problems of plasma production and confinement. Nonlinear and relativistic effects including quasi-linear theory, relativistic beams, synchrotron radiation and laser heating of plasmas. Computer simulation of plasma phenomena.

289A-J. Special Topics in Applied Science (1-5) I, II, III. The Staff (Wooten in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in the following areas: **(A)** Atomic and Molecular Physics; **(B)** Chemical Physics; **(C)** Computational Physics; **(D)** Computer Science; **(E)** Materials Science; **(F)** Nuclear Science; **(G)** Nonlinear Optics; **(H)** Plasma Physics; **(I)** Quantum Electronics; **(J)** Solid State. May be repeated up to a total of 5 units per segment.

290. Seminar (1-2) I, II, III. The Staff (Wooten in charge)
Seminar—1-2 hours. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Wooten in charge)
Such topics as neutron physics, nuclear technology, advanced hydrodynamics, plasma physics, or advanced mathematics.

299. Research (1-12) I, II, III. The Staff (Wooten in charge) (S/U grading only.)

Livermore

Upper Division Courses

101. Data Structures (3) I. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Introduction to high level language programming techniques that are useful in all programming courses. Topics include

NOTE: For key to footnote symbols, see page 123.

progamming language Pascal, lists, queues, trees, graphs, sorting and searching algorithms, and memory management algorithms.

103. Introduction to Computer Architecture (3) I. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Basic hardware knowledge for computer science students. Main elements of computer hardware and how they function. Covers topics like number systems, symbolic logic, assembly language, and logic implementation. Several assembly language programs.

106. Language Structures (3) II. The Staff
Lecture—3 hours. Prerequisite: course 101 or the equivalent. Fundamental structure of a programming language, and an introduction to language processing. Topics include types, objects, operations, block structure, parameter passing, linkers and loaders, and lexical analysis.

108. Concurrent Programming (3) III. Slezak
Lecture—3 hours. Prerequisite: course 103 or 106 or the equivalent. Presentation of concepts surrounding concurrent programming, as an introduction to operating systems. Focus on concepts of processes and synchronization, emphasizing their use in solving classical problems. This material is then related to operating system design.

111. Introduction to Foundations of Computing (3) II. Blattner
Lecture—3 hours. Prerequisite: course 101; Electrical and Computer Engineering 191. Basic ideas in the theory of computing and the analysis of algorithms. Topics included: finite automata, regular and context-free grammars, order of execution time and space, advanced programming techniques.

113. Computer Graphics (3) II. Max
Lecture—3 hours. Prerequisite: Mathematics 21C, 22A, Computer Science Engineering 80. Development of the algorithms for producing perspective line drawings of three-dimensional objects, as defined by polygons or by bicubic surface patches.

115. Introduction to Numerical Methods for Computers (3) I, Talley
Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Lectures and laboratory work on electronic computers and their application to engineering problems.

135. Introductory Nuclear Science and Technology (3) I, Bloom
Lecture—3 hours. Prerequisite: Physics 121 or the equivalent. Introductory aspects of nuclear phenomena, nuclear masses, size, energy, and decay modes. Interaction of particles and electromagnetic radiation with matter. Instrumentation and theory of measurements; neutron technology. Nuclear chemistry.

198. Group Study (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor. Group study of selected topics. Students may enroll in one or more separate sections. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201. Software Engineering (3) III. Blattner
Lecture—3 hours. Prerequisite: courses 101, 103, 106, or the equivalent. Examination of the process of writing production-quality software and the tools that have been designed to aid in this effort. Subject matter will include: requirements specification, design methodologies, programming style, program testing, and performance evaluation.

202. Data Base Management (3) II. Johnson
Lecture—3 hours. Prerequisite: courses 101, 103. Discussion of database models and their implementations. Course roughly divided into thirds: physical organization, logical organization, and distributed systems.

203A. Computer Architecture (3) I, Anderson
Lecture—3 hours. Prerequisite: course 103 or the equivalent. Detailed design and organization of computer hardware and associated input and output devices. Topics include logic families, addressing methods, memory design, I/O devices, a survey of various architectural structures, and communication systems. A programming project will be performed.

203B. Computer Architecture (3) III. Anderson
Lecture—3 hours; research paper and programming project. Prerequisite: course 203A. Topics in computer communication, hardware features to enhance operating systems, and advanced architectures.

205A. Mathematical Methods (3) I, Newcomb
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. Newcomb
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. Newcomb
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.

206. Programming Languages (3) III. The Staff
Lecture—3 hours; programming project. Prerequisite: course 106 or the equivalent. Examines topics in language design as the contour model and binding times, abstract data types, functional languages, and syntax analysis.

207. Compiler Construction (3) I, Skedzielewski
Lecture—3 hours. Prerequisite: course 206. Syntax-directed translation techniques are used to implement a compiler for a block-structured, high-level programming language. Emphasis given to semantic analysis and code generation.

208A. Operating Systems I (3) I, Nessett
Lecture—3 hours. Prerequisite: courses 108, 203B. Design of an operating system. Emphasis given to mechanisms commonly used to implement systems and the various policy options. Course stresses the Kernel design approach.

208B. Operating Systems II (3) II. Watson
Lecture—3 hours. Prerequisite: course 208A. Concentration on operating system structure, interprocess communication, and issues of naming, error control, protection, synchronization, abstract object representation and encoding, resource management, and measurement in distributed operating systems. Course integrates design goals, problems, and mechanisms.

209. Numerical Solutions of Partial Differential Equations (4) I, Mirin
Lecture—4 hours. Prerequisite: courses 115, 205A, 205B, 205C. Numerical methods applicable to the solution of partial differential equations. Emphasis on finite difference methods for hyperbolic, parabolic and elliptic systems.

210A-210B. Advanced Methods of Computational Physics (3-3) II-III. Mirin
Lecture—3 hours. Prerequisite: course 209 or Mathematics 228A-228B or the equivalent. Computational methods in various fields including: hydrodynamics, plasma physics, magnetohydrodynamics, Vlasov and Fokker-Planck equations, particle codes, neutron and radiation transport, chemical kinetics, and atmospheric modeling.

211. Automata Theory and Formal Languages (3) I, Blattner
Lecture—3 hours. Prerequisite: course 111. Relation between type (0) through type (2) languages and their respective machines (turing machine, linear bounded automata and push down automata) is discussed. Decidability and the Halting problem discussed.

212. Analysis of Algorithms (3) III. Fletcher
Lecture—3 hours. Prerequisite: course 111. Investigation of time and space requirements of commonly used programming tasks, such as searching, sorting, set manipulation and graph algorithms. NP completeness and intractability also discussed.

213. Computer Graphics (3) III. Max
Lecture—3 hours. Prerequisite: course 113. Development of the algorithms for producing realistic color shaded images of three-dimensional objects.

214. Computing with Symbolic Expressions (3) III. Fletcher
Lecture—3 hours. Prerequisite: courses 211 and 212 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.

215A. Computational Mathematics (3) II. Rodrique
Lecture—3 hours. Prerequisite: course 115 or the equivalent. First course of a two-course sequence that focuses on computational methods for solving numerical problems. Emphasis is on solutions applicable to computers. Topics covered: linear systems, non-linear systems, approximation, and interpolation.

215B. Computational Mathematics (3) III. Rodrique
Lecture—3 hours. Prerequisite: course 215A. Second course of a two-course sequence that focuses on computational methods for solving numerical problems. Emphasis is on solutions applicable to computers. Topics covered: optimization, integration, differentiation, and ordinary differential equations.

216A-G Special Topics in Computer Science (1-5) I, II, III.
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in the following areas: **(A)** Architecture; **(B)** Software Systems; **(C)** Language Translation; **(D)** Language Design; **(E)** Operating Systems; **(F)** Foundations of Computing; **(G)** Computational Mathematics.

224. Microprogramming and Microprogrammable Architecture (3) III. Anderson
Lecture—3 hours. Prerequisite: consent of instructor. Concepts of microprogramming, design and implementation of the internal logic and data to form the hardware primitives. Survey of the architecture of commercially available, user-microprogrammmable computers. Course includes a programming project on a department computer.

228A-228B-228C. Properties of Matter (3-3-3) I-II-III. Hoover
Lecture—3 hours. Prerequisite: Mathematics 22B and Physics 112B. Microscopic and macroscopic descriptions of matter; thermodynamics and kinetics; constitutive, electrical, mechanical and thermal properties.

229. Materials Science (3) II. Guinan
Lecture—3 hours. Prerequisite: course 205C. Facts and theories of crystal defect physics and their application to such problems as the mechanical properties of solids, radiation damage, phase transformations, etc. Covers thermodynamics of point defects, diffusion, elasticity dislocation theory.

230A-230B-230C. Structure of Matter (3-3-3) I-II-III. Goldberg
Lecture—3 hours. Prerequisite: course 205C. Classical properties of matter; introduction of quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules and solids; quantum theory of cooperative effects.

233A-233B-233C. Theory and Applications of Solid-State Physics (3-3-3) I-II-III. The Staff (Wooten in charge)
Lecture—3 hours. Prerequisite: course 230C or the equivalent. Structure and properties of crystals; theory of dielectrics, metals and alloys; magnetism, superconductivity, and semiconductors. Applications to various solid-state devices.

234A-234B-234C. Electromagnetic Theory (3-3-3) I-II-III. Goldberg
Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 131B. 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 135, 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.

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.

262A-262B-262C. Atomic Structure and Interactions (3-3-3) I-II-III. Goldberg
Lecture—3 hours. Prerequisite: course 230A-230B-230C or the equivalent. Atomic and molecular spectra, calculational methods. Dirac theory of hydrogen, radiative decay, photoionization, elastic and inelastic electron scattering.

265A-265B-265C. Theory and Applications of Lasers (3-3-3) I-II-III. Haas
Lecture—3 hours. Prerequisite: courses 230C and 234B (or the equivalent). Theory of lasers, properties of laser systems, electro-optical devices. Interaction of light with matter, laser spectroscopy, nonlinear optics. Theory of the coherent photon field, Fourier optics, holography, application of lasers in technology.

280A-280B-280C. Plasma Physics and Controlled Fusion (3-3-3) I-II-III.
Post Lecture—3 hours. Prerequisite: course 234B or consent of instructor. Equilibrium plasma properties; single particle motion; fluid equations; waves and instabilities in a fluid

NOTE: For key to footnote symbols, see page 123.

plasma; plasma kinetic theory and transport coefficients; linear and nonlinear Vlasov Theory; fluctuations, correlations and radiation; inertial and magnetic confinement systems in controlled fusion.

285A-285B-285C. Advanced Plasma Physics (3-3-3) I-II-III. Post
Lecture—3 hours. Prerequisite: courses 280A-280B-280C. Plasma kinetic theory; applications of the Fokker-Planck equation; advanced instability theory. Practical problems of plasma production and confinement. Nonlinear and relativistic effects including quasi-linear theory, relativistic beams, synchrotron radiation and laser heating of plasmas. Computer simulation of plasma phenomena.

289A-J. Special Topics in Applied Science (1-5) I, II, III. The Staff (Wooten in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in the following areas: **(A)** Atomic and Molecular Physics; **(B)** Chemical Physics; **(C)** Computational Physics; **(D)** Computer Science; **(E)** Materials Science; **(F)** Nuclear Science; **(G)** Nonlinear Optics; **(H)** Plasma Physics; **(I)** Quantum Electronics; **(J)** Solid State. May be repeated up to a total of 5 units per segment.

290. Seminar. (1-2) I, II, III. The Staff (Wooten in charge)
Seminar—1-2 hours. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: consent of instructor. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Wooten in charge)
Such topics as computer science, plasma physics, materials science, laser applications, bio-medicine.

299. Research (1-12) I, II, III. The Staff (Wooten in charge)
(S/U grading only.)

Engineering: Chemical

(College of Engineering)

Benjamin J. McCoy, Ph.D., Chairperson of the Department

Department Office, 3092 Bainer Hall (752-0400)

Faculty

Richard L. Bell, Ph.D., Professor
Roger B. Boulton, Ph.D., Associate Professor *(Chemical Engineering, Viticulture and Enology)*
Brian G. Higgins, Ph.D., Assistant Professor
Alan P. Jackman, Ph.D., Professor
Benjamin J. McCoy, Ph.D., Professor
Ahmet N. Palazoglu, Ph.D., Assistant Professor
Robert L. Powell, Ph.D., Associate Professor
Dewey D.Y. Ryu, Ph.D., Maynard A. Amerine, Professor *(Chemical Engineering, Viticulture and Enology)*
J. M. Smith, Sc.D., Professor
Pieter Stroeve, Sc.D., Professor
†Stephen Whitaker, Ph.D., Professor

Courses in Engineering: Chemical

Lower Division Courses

1. The Scope of Chemical Engineering (1) II. The Staff (McCoy in charge)
Lecture—1 hour; discussion—1 hour. Demonstrations and discussions of the opportunities in chemical engineering for professional development, contributions to basic knowledge, and service to society. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (McCoy in charge)
Prerequisite: consent of instructor; restricted to lower division students. Group study of selected topics. Students may enroll in more than one section. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (McCoy in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

150A. Chemical Engineering Fluid Mechanics (3) II. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: Mathematics 22A, 22B, 22C. 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 who have taken Engineering 103A may not receive credit for this course.

150B. Chemical Engineering Fluid Mechanics (3) III. The Staff (McCoy in charge)
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 who have taken Engineering 103B or Civil Engineering 141 may not receive credit for this course.

151. Material Balances (3) I. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: Chemistry 110A and 128B (may be taken concurrently); a working knowledge of FORTRAN. Application of principles of conservation of mass for single and multi-component systems in chemical process calculations. Studies of batch, semi-batch and continuous processes involving mass transfer, change of phase and chemical reaction.

152A. Chemical Engineering Thermodynamics (3) II. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: course 151; Chemistry 110A. Application of principles of thermodynamics to chemical processes. Students who have had Engineering 105A may not receive credit for this course.

152B. Chemical Engineering Thermodynamics (3) III. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: course 152A. Continuation of course 152A. Students who have had Engineering 105B may not receive credit for this course.

153. Chemical Engineering Heat Transfer (4) III. The Staff (McCoy in charge)
Lecture—4 hours. Prerequisite: course 150A. Steady and transient heat conduction. The thermal energy equation, analysis of forced and free convective heat transfer. Turbulence, macroscopic balances, and heat transfer coefficients. The photon transport equation and radiant energy exchange. The design of heat exchangers.

154A. Mass Transfer (3) I. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: course 153, Chemistry 110A. Fundamental concepts of mass transfer in fluids. Problems in pure diffusion and convective mass transfer.

154B. Applications of Mass Transfer (3) II. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: course 154A. Application of the principles of mass transfer and thermodynamic equilibrium to absorption, extraction, distillation and other separation processes.

155A. Chemical Engineering Laboratory (4) I, II. The Staff (McCoy in charge)
Laboratory—12 hours. Prerequisite: course 154A. Laboratory experiments in heat, mass, and momentum transfer and in chemical kinetics.

155B. Chemical Engineering Laboratory (4) II, III. The Staff (McCoy in charge)
Laboratory—12 hours. Prerequisite: courses 154B, 155A. Continuation of 155A.

156A. Chemical Engineering Kinetics (3) II. The Staff (McCoy in charge)
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. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: course 156A. Continuation of course 156A.

157. Process Dynamics and Control (4) I, III. The Staff (McCoy in charge)
Lecture—3 hours; Laboratory—3 hours. Prerequisite: courses 152B, 153. Fundamentals of the dynamics of linear chemical processes. Classical feedback and feed forward control of dynamic processes. Direct digital control. Laboratory experiments in process dynamics, analog and digital feedback control.

158. Chemical Engineering Process Design (3) III. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: Engineering 106 (may be taken concurrently), courses 154B, 156A, 160. Chemical Engineering process design; optimization and economics.

159. Chemical Engineering Analysis (3) I. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: Mathematiics 22B. Chemical engineering applications of partial differential equations, tensors, systems of linear equations, and operational calculus.

160. Design of Piping Systems and Heat Exchangers (3) I. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: courses 150B and 153. Design of piping systems including pumps, compressors and valves. Shortcut methods for approximating pressure drop in piping. Design of shell and tube heat exchangers.

161. Biochemical Engineering Fundamentals (3) II. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: Chemistry 128A and Mathematics 22B. Enzyme and microbial kinetics, reactor designs for single and mixed cultures with examples drawn from the full range of applications: medical analysis, food processing, pharmaceutical and biochemicals production, single-cell protein production, biological waste treatment, and environmental modelling.

163. Chemical Engineering in Integrated Circuit Fabrication Technology (3) I. Stroeve
Lecture—3 hours. Prerequisite: course 154A (concurrently); Chemistry 128B. Manufacture of semiconductor devices, integrated circuits, magnetic bubble memories, tapes and disks involves application of chemical engineering processing techniques. Course introduces student to the chemistry and engineering of the industrial fabrication of modern circuits and devices.

190C. Research Group Conferences (1) I, II, III. The Staff (McCoy in charge)
Discussion—1 hour. Prerequisite: upper division standing in Chemical Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

198. Group Study (1-5) I, II, III. The Staff (McCoy in charge)
Prerequisite: consent of instructor. Group study of selected topics. Student groups may be organized in instrumentation and design problems. Students may enroll in one or more separate subjects. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (McCoy in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

226. Enzyme Engineering (3) II. Ryu
Lecture—3 hours. Prerequisite: Biochemistry 123 or consent of instructor; Biochemistry 133, Food Science and Technology 110A-110B, Chemical Engineering 151, Bacteriology 102 recommended. Application of basic biochemical and engineering principles of practical enzymatic processes. Lectures cover large scale production and separation of enzymes, immobilized enzyme systems, enzyme reactor design and optimization, and new application of enzymes in genetic engineering related biotechnology. Offered in even-numbered years.

246. Advanced Biochemical Engineering (2) I, II, III. Ryu
Lecture—1 hour; discussion—1 hour. Prerequisite: course 161, Food Science and Technology 206, or consent of instructor. Advances in the field of biotechnology including genetic engineering, enzyme engineering, fermentation science, and renewable resources development. The important results of original research will be evaluated for understanding of the fundamental principles and for potential practical application.

252. Advanced Thermodynamics (3) I. The Staff (McCoy in charge)
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 Fluid Mechanics (3) I. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: courses 150A, 150B, and 259 (may be taken concurrently) or the equivalent. Kinematics and basic principles of fluid flow. Principles of constitutive equations. Navier-Stokes equations for Newtonian fluids. Survey of creeping flow, ideal flow and boundary layer theory. Macroscopic mass, momentum and mechanical energy balance.

253B. Advanced Heat Transport (3) II. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: courses 153 and 259 or the equivalent. Fundamental energy postulates and derivation of microscopic and macroscopic energy equations. Mechanisms of conduction. Solution to conduction problems, photon transport, black and grey body radiation and radiant exchange. Free convection equations and correlations. Forced convection.

253C. Advanced Mass Transfer (3) II. The Staff (McCoy in charge)
Lecture—3 hours. Prerequisite: courses 154A, 154B, and 259 (may be taken concurrently) or the equivalent. Kinematics and basic conservation principles for multicomponent systems. Constitutive equations for momentum, heat and mass transfer. Applications to binary and ternary systems. Details of diffusion with reaction, and the effects of concentration.

NOTE: For key to footnote symbols, see page 123.

254. Colloid and Surface Phenomena (3) II. Stroeve
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Colloid and surface phenomena occur in a wide spectrum of problems encountered in engineering and science. Introduction to the behavior of surfaces and disperse systems. Fundamentals will be applied to the solution of practical problems.

***255. Catalysis in Chemical Engineering** (3) II.
Lecture—3 hours. Prerequisite: graduate student standing in Chemical Engineering or Chemistry. Principles of surface chemistry and heterogeneous catalysis followed by treatment of reaction systems of industrial importance. Applications include (ammonia synthesis, methanation) synthetic fuel production, cracking, reforming, hydrogenolysis, hydrodesulfurization, hydrodenitrogenation, polymerization, partial oxidation, auto exhaust catalysis and fuel cell operations.

256. Applied Kinetics and Reactor Design (3) III. Whitaker
Lecture—3 hours. Prerequisite: courses 253B, 253C. Application of kinetics and molecular transport rates to the design of chemical reactors with emphasis on heterogeneous systems.

257. Reactor Design (3) III. Smith
Lecture—3 hours. Prerequisite: course 156B. Application of concepts of chemical reaction engineering to the two-step process of reactor design: (1) interpretation of laboratory-scale data, and (2) utilization of the interpretation for the design of commercial-scale reactors for real chemical systems.

259. Advanced Chemical Engineering Analysis (4) I. The Staff (McCoy in charge)
Lecture—4 hours. Prerequisite: Mathematiics 22A, 22B, 22C. Applications of methods of applied mathematics to the analytical and numerical solution of partial differential equations arising in the study of momentum, heat, and mass transfer.

260. Separation Processes: Particulate Systems (3) I, Bell
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 characterisitcs, moment analysis, optimization.

262. Transport Phenomena in Multiphase Systems (3) III. Whitaker
Lecture—3 hours. Prerequisite: course 253C. Heat, mass and momentum transfer in multiphase, multicomponent systems with special emphasis on transport processes in porous media. Derivation of the averaging theorem and application of the method of volume averaging to multicomponent, reacting systems.

290. Seminar (1) I, II, III. The Staff (McCoy in charge)
Seminar—1 hour. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff (McCoy in charge)
Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress and techniques in chemical engineering. May be repeated for credit. (S/U grading only.)

291. Seminar in Multiphase Transport Phenomena (1) I, II, III. Whitaker
Seminar—1 hour. Prerequisite: graduate or senior standing. Seminar devoted to the theoretical and practical applications of multiphase transport phenomena. Subjects will include flow in porous media, dispersion with absorption and reaction, and heat transfer in multiphase systems with chemical reaction. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (McCoy in charge)

299. Research (1-12) I, II, III. The Staff (McCoy in charge) (S/U grading only.)

Engineering: Civil

(College of Engineering)

Gerald T. Orlob, Ph.D., Chairperson of the Department (752-1424)

Department Office, 206 Walker Hall (752-0586)

Faculty

[1]Kandiah Arulanandan, Ph.D., Professor
Takashi Asano, Ph.D., Adjunct Professor
[3,4]Don O. Brush, Ph.D., Professor
Robert H. Burgy, M.S., Professor *(Civil Engineering; Land, Air and Water Resources)*
Daniel P. Y. Chang, Ph.D., Associate Professor
James A. Cheney, Ph.D., Professor
Yannis F. Dafalias, Ph.D., Associate Professor
Otto J. Helweg, Ph.D., Associate Professor
Leonard R. Herrmann, Ph.D., Professor
James R. Hutchinson, Ph.D., Professor
William K. Johnson, M.S., Visiting Lecturer
Ian King, Ph.D., Associate Professor
[3,4]Ryuichi Kitamura, Ph.D., Assistant Professor
Ray B. Krone, Ph.D., Professor
Bruce Kutter, Ph.D., Adjunct Assistant Professor
[2]Tenny N. Lam, D.Eng., Professor
Bruce E. Larock, Ph.D., Professor
Miguel A. Mariño, Ph.D., Professor *(Civil Engineering; Land, Air and Water Resources)*
Gerald T. Orlob, Ph.D., Professor
Otto G. Raabe, Ph.D., Adjunct Associate Professor *(Civil Engineering; Laboratory for Energy-Related Health Research)*
Melvin R. Ramey, Ph.D., Professor
Karl M. Romstad, Ph.D., Professor
Edward D. Schroeder, Ph.D., Professor
Verne H. Scott, Ph.D., Professor *(Civil Engineering; Land, Air and Water Resources)*
Chih-Kang Shen, Ph.D., Professor
Daniel Sperling, Ph.D., Assistant Professor *(Civil Engineering; Environmental Studies)*
Michael A. Taylor, Ph.D., Associate Professor
George Tchobanoglous, Ph.D., Professor

Courses in Engineering: Civil

Lower Division Courses

1. The Civil Engineer in Society (1) I. The Staff (Chairperson in charge)
Lecture—1 hour. A description of the field of civil engineering and the function of the professional civil engineer. Discussion of professional practice with respect to application of engineering principles, ethics, and responsibilities. (P/NP grading only.)

10. Introduction to Surveying (3) III. The Staff (Chairperson in charge)
Lecture—2 hours; laboratory—3 hours. Theory and practice of measurements for distance, elevations, and angles; the analyses and adjustments for systematic and random meas urement errors; line directions, traverse computations, horizontal and vertical curves; astronomical observations and calculations for latitude, longitude, azimuth, and time.

92. Internship in Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Work-learn experience. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work-study experience in civil engineering. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (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 (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. Calculation of displacements. Methods of virtual work, moment area, superposition, slope deflection, moment distribution.

131B. Matrix Structural Analysis and Introduction to Finite Element (3) I, Romstad
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104B. Matrix formulation and computer analysis of statically indeterminate structures. Introduction to finite element methods for elasticity and bending problems.

132A. Structural Design: Metallic Elements (3) II. Ramey
Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Metallic beams, columns, other members; analysis and design of bolted and welded joints; design of simple beam connections, moment resistant connections, and column base plates.

132B. Structural Design: Concrete Elements (3) I, III. 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) III. 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) II. Cheney
Lecture—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). Analysis of skin stringer construction for aircraft and missile structures. Shear flow in open, closed and multicell beam cross sections, buckling of flat and curved sheets, semi-tension field beams, local buckling, crippling and wrinkling. Design of aircraft structural connections. Analysis of pressurized structures.

137. Construction Principles (3) III. The Staff (Chairperson in charge)
Lecture—2 hours; laboratory—3 hours. Prerequisite: senior standing in Engineering. A study of the construction industry; its form, evolution, and methods of operation; fundamental principles underlying construction practices; economic factors in planning, organizing, and operating a construction force. Field trips and analysis of local construction projects.

138. Earthquake Loads on Structures (3) I, Romstad
Lecture—3 hours. Prerequisite: course 131A; Engineering 102A. Determination of loads on structures due to base motions. Methods of static lateral forces, approximate dynamic analysis (response spectrum), and time history. Concepts of mass, damping, and stiffness for typical structures. Design for inelastic behavior. Consideration of wind and blast loading.

139. Prestressed Concrete (3) II. Taylor
Lecture—3 hours. Prerequisite: course 132B. Principles and methods, analysis and design of sections for bending, interactive computer analysis, ultimate strength of sections. Loss of prestress, shear design. Applications to bridges, buildings, and tanks. Special materials properties needed for effective prestressing.

141. Engineering Hydraulics (3) I, III. Larock
Lecture—3 hours. Prerequisite: Engineering 103A. Nature of flow of a real fluid; flow in pipes; open channel flow; turbomachinery; fluid forces on objects: boundary layers, lift and drag.

141L. Engineering Hydraulics Laboratory (1) I, III. Larock
Laboratory—3 hours. Prerequisite: course 141 (may be taken concurrently). Laboratory experiments and demonstrations on flow measurement, sluice gates, hydraulic jump, flow characteristics, and centrifugal pumps.

142. Engineering Hydrology (3) I, II. Orlob
Lecture—3 hours. Prerequisite: course 141 (may be taken concurrently). Study of the hydrologic cycle. Analysis of precipitation processes. Hydrologic mechanisms. Streamflow. Flood routing. Groundwater. Stochastic processes in hydrology. Hydrologic design of engineering systems.

143. Water Resources Engineering and Management (3) II Scott
Lecture—3 hours. Prerequisite: course 142 recommended. Engineering and management concepts affecting the planning, development, design and operation of multipurpose projects. Consideration of water sources, data, quality and uses; policies, legislation; institutions; laws; economics; environmental concerns; and public participation.

144. Groundwater Systems Design (3) I, Mariño
Lecture—3 hours. Prerequisite: course 142 (may be taken concurrently). Groundwater occurrence, distribution, and exploration. Well-flow systems. Design of wells. Aquifer management, safe yield and overdraft. Conjunctive use of surface water and groundwater. Artificial recharge. Groundwater quality and contamination.

145. Hydraulic Systems Design (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 141, 141L, 142. Principles of project planning. Methods of analysis and hydraulic design of storage systems; diversion structures; conveyance and regulation systems; structures for irrigation, power, and flood control projects; pipeline networks; water connection systems.

146. Water Resources Systems Engineering (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 142 and 153; course 144 or 145 recommended. Application of systems analysis techniques in the design of water resource projects. Introduction to simulation theory and mathematical modeling. Applications of simulation models (computer models). Introduction to various state-of-the-art water resource models.

NOTE: For key to footnote symbols, see page 123.

147. Solid Waste Management (3) I, Tchobanoglous
Lecture—2 hours; laboratory—3 hours. Characteristics and amounts of solid wastes; collection systems; introduction to waste treatment processes and return of treated wastes to the environment.

148A. Water Quality Management (3) II, III. Schroeder
Lecture—3 hours. Prerequisite: course 142. Introduction to basic concepts of water quality. Fundamentals of water and wastewater treatment processes. Analysis of treatment process flowsheets. Analysis of water quality management alternatives.

148B. Water Quality Management Systems Design (3) III. Tchobanoglous
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 148A (may be taken concurrently). Introduction to the design of water and wastewater treatment processes.

149A. Introduction to Air Pollution (3) I, Carroll (Land, Air and Water Resources), Chang, Raabe
Lecture—3 hours. Prerequisite: Mathematics 22B, 22C; Chemistry 1B; Atmospheric Science 121A or Engineering 103A. Examination of physical and technical aspects of air pollution. Emphasis on geophysical processes and air pollution meteorology as well as physical and chemical properties of pollutants. (Same course as Atmospheric Science 149A.)

149B. Air Pollution Control (3) II. Chang
Lecture—3 hours. Prerequisite: Engineering 105A, Atmospheric Science 149A/course 149A (or the equivalent). Introductory course in the evaluation and design of air pollution control devices and systems.

152. Introduction to Civil Engineering Planning (3) I. The Staff (Chairperson in charge)
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. Lam
Lecture—3 hours. Prerequisite: Mathematics 21C and 22A; Engineering 5 or the equivalent. Introduction to operations research. Optimization techniques such as linear programming, dynamic programming, and nonlinear programming. Applications, in water resources planning, transportation planning, systems engineering, and other civil engineering disciplines.

160. Introduction to Transportation Planning (3) I, Sperling
Lecture—3 hours. Prerequisite: course 152 or consent of instructor. Historical approach to transportation planning and role of transportation in modern society. Emphasis on urban transport and mass transit. Incorporation of economic, environmental and public service goals into transportation planning. Theory and practice in implementing transportation plans.

161. Transportation Systems Engineering (3) II. Kitamura
Lecture—3 hours. Prerequisite: Engineering 102A. Planning, design, and operation of transportation systems. Introduction to systems engineering and modeling. Characteristics of transportation systems. Conceptual design and functional operation of multi-modal systems.

162. Transportation Facilities Design (3) III. Lam
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 10 and Engineering 102A. 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. Arulanandan
Lecture—3 hours. Prerequisite: Engineering 104A (may be taken concurrently). Soil formations, mass-volume relationships, principle of effective stress, soil characteristics (classification and identification), compaction, capillarity and permeability, compressibility and consolidation, strength—state of stress and failure criteria.

172. Soil Properties, Soil Behavior, and Engineering Applications (2) I, III. Shen
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 171 (may be taken concurrently). Laboratory studies of physical, mechanical and hydraulic properties of soils and the use of these properties to predict the soil behavior in engineering investigation of geotechnical problems.

173. Foundation Design (4) II. Shen
Lecture—4 hours. Prerequisite: courses 132B and 171. Theory of consolidation and its application to foundation design; methods of minimizing settlements and effect of settlement on structures; bearing capacity of soils; footing design; lateral earth pressures; retaining-wall design; pile and pile foundation.

175. Introduction to Geological Engineering (3) III. Shen
Lecture—2 hours; laboratory—3 hours. Prerequisite: junior standing in civil engineering, geology, and related fields with consent of instructor. Introduction to the principles of geology, and the study of geologic features that affect engineering structures. Discussion of geological aspects of engineering construction problems by means of case history studies. (Same course as Geology 175.)

177. Soil-Water Dynamics Laboratory (2) III. Cheney
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 171. Laboratory experiments in current research areas in soil dynamics. Topics to vary from year to year. Examples: excavation by explosives, impact penetration in soft soils, simulated earthquakes in centrifuge models, seepage erosion in soil.

189A-J. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
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. May be repeated for credit when the topic is different.

192. Internship in Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper division standing; approval of project prior to the period of the internship. Supervised work-study experience in civil engineering. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: 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: courses 201 and 221 (may be taken concurrently). Analysis of the buckling behavior of structural members: buckling of columns, lateral buckling of beams, nonlinear bending and lateral-torsional buckling of beam-columns, stability of structural frames, buckling strength and ultimate strength of plates.

203. Inelastic Behavior of Solids: 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 even-numbered years.

204. Viscous Behavior of Solids (3) III. Dafalias
Lecture—3 hours. Prerequisite: course 201. Fundamentals of theories of viscoelasticity and viscoplasticity for solids. Characterization of engineering materials, e.g., concrete, soil, asphalts, rubbers, etc. General analysis procedures for problems in viscoelasticity. Offered in odd-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 nonlinear elasticity and viscoelasticity. Solution of three-dimensional problems. Offered in odd-numbered years.

211. Advanced Matrix Structural Analysis (3) II. Romstad
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 131A, and course 131B or consent of instructor. Computer analysis of complex frameworks by the displacement method; treatment of tapered, curved and beam on elastic foundation members; partially rigid connections; nonlinear and stability analysis; introduction to structural optimization.

212A. Finite Element Procedures in Applied Mechanics (3) II. Herrmann
Lecture—3 hours. Prerequisite: Applied Science 115 or Mathematics 128A-128B (128B may be taken concurrently), or consent of instructor. Approximate analysis procedures; Galerkin and stationary principle methods. Construction of approximate solutions by the finite element method. Applications to one- and two-dimensional problems in engineering. Introduction to time dependent, non-linear and 3-D problems, and other approximation procedures.

212B. Finite Elements: Application to Linear and Nonlinear Structural Mechanics Problems (3) III. Herrmann
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 212A. Application of the finite element method to linear and nonlinear one-, two-, and three-dimensional problems in continuum mechanics, soil mechanics, and to plate and shell theories.

212C. Finite Elements: Application to Fluid Problems (2) III. Larock
Lecture—2 hours. Prerequisite: courses 141, 212A; additional knowledge of fluid mechanics recommended. Application of the finite element method to two- and three-dimensional fluid flow problems, including inviscid and viscous flow, convection-diffusion problems, the shallow water equations and flow through porous media.

213. Analysis of Structures Subjected to Dynamic Loads (3) III. Romstad
Lecture—3 hours. Prerequisite: courses 138, 211. Analysis of structures subjected to earthquake wind and blast loading; distributed, consistent and lumped mass techniques; development of a computer program for complex structures; nonlinear response spectrum analysis; frequency and time domain analysis.

221. Theory of Plates (3) I, Herrmann
Lecture—3 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 composite plates. Classical and finite element analysis procedures. Thick and nonlinear plate theories.

222. Theory and Analysis of Shells (3) II. Brush, Hermann
Lecture—3 hours. Prerequisite: course 221. Development of membrane and bending solutions for simple shells. Slab-beam analysis of folded plates. General theory and computer analysis of complex shells.

232. Advanced Topics in Concrete Structures (3) I, Taylor
Lecture—3 hours. Prerequisite: course 132B. Ductility of reinforced concrete; design for torsion of structural concrete; yield line theory for the design of concrete slabs; analysis and design of deep reinforced concrete beams.

233. Advanced Design of Steel and Concrete Structures (3) II. Ramey
Lecture—3 hours. Prerequisite: courses 132A, 132B, 202 (may be taken concurrently). Design considerations for column and frame buckling; design for combined biaxial bending and axial loading of concrete compression members; steel-concrete composite design; steel-plate girder 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.

242A. Air Quality (3) III. Chang
Lecture—3 hours. Prerequisite: Engineering 105A and courses 141 and 149A or the equivalent. Factors determining air quality. Effects of air pollutants. Physical and chemical fundamentals of atmospheric transport and reaction. Introduction to dispersion modelling.

242B. Airborne Particles and Scavenging Mechanisms (3) I, Raabe
Lecture—3 hours. Prerequisite: Engineering 105A, 103A, courses 141, 149A; or consent of instructor. Generation, characterization and behavior of small particles and droplets suspended in gas including deposition and scavenging of airborne particles in the earth's atmosphere.

242BL. Airborne Particles Laboratory (1) I, Raabe
Laboratory—3 hours. Prerequisite: course 242B (may be taken concurrently). Laboratory exercises designed to familiarize the student with methods generation and characterization of airborne particles.

243A. Water and Waste Treatment (3) I, Schroeder
Lecture—3 hours. Prerequisite: course 148A. Characteristics of water- and airborne-wastes; treatment processes and process kinetics; treatment system design.

243B. Water and Waste Treatment (3) II. Schroeder
Lecture—3 hours. Prerequisite: course 243A; consent of instructor. Continuation of course 243A.

244. Environmental Quality Modeling (3) III. Orlob,
Lecture—2 hours; laboratory—3 hours. Prerequisite: one courses from courses 240, 241, or 242A (may be taken concurrently). Mathematical modeling of environmental quality, with emphasis on mathematical models of quality,

NOTE: For key to footnote symbols, see page 123.

their structure, capabilities and limitations, sensitivity and reliability, as analytical and/or predictive tools.

245. Applied Aqueous-Solution Chemistry (3) I, Chang
Lecture—3 hours. Prerequisite: Engineering 105A, Chemistry 1A, 1B or the equivalent; Chemistry 5 and/or Chemistry 107A recommended. Chemical principles underlying current practices in the examination and treatment of aqueous systems. Topics include: chemical equilibrium, redox reactions, surface chemistry. Offered in odd-numbered years.

245L. Applied Aqueous-Solution Chemistry Laboratory (1) I, Chang
Laboratory—3 hours. Prerequisite: Chemistry 1A-1B (or the equivalent); course 245 or Chemistry 5 recommended. Introduction to laboratory practice in the examination of water and wastewater. "Wet chemical" and instrumental techniques.

246A. Pilot Plant Laboratory: Physical Chemical Processes (3) II. Tchobanoglous
Lecture—1 hour; 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 (3) III. Schroeder
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 243B or consent of instructor. Study of selected biological systems used in wastewater management.

250. Transportation Policy Planning (3) III. Sperling
Lecture—3 hours. Prerequisite: course 152; course 160 (may be taken concurrently). Socio-technical nature of transportation. The societal, technical, and system bases for planning transportation developments. Policy framework of transportation developments and characteristics of planning process. Development of objectives, policy alternatives, and programs and factors and considerations involved in evaluations and decisions. Offered in odd-numbered years.

251. Transportation Planning Models (3) II. Kitamura
Lecture—3 hours. Prerequisite: course 160. Detailed study and discussions of quantitative models of urban passenger transportation including trip generation, modal split, trip distribution, network assignment, and direct demand models. Brief discussions of land-use models and freight transportation. Offered in even-numbered years.

252. Evaluation of Transportation Alternatives (3) III. Kitamura
Lecture—3 hours. Prerequisite: Environmental Studies 168A or the equivalent. Study of theory and practice of transportation evaluation. Topics include transportation economics, pricing, theoretical and applied transportation evaluation techniques, and use of citizen participation in transportation evaluation. Offered in even-numbered years.

254. Transportation Attitudes and Behavior (3) II. Kitamura
Lecture—3 hours. Prerequisite: course 160. Study of individual and household travel decisions. Emphasis is on conceptual and statistical issues involved in the specification of mathematical models of travel behavior. Objective and attitudinal explanations of travel behavior are considered. Planning applications are explored. Offered in odd-numbered years.

255. Characteristics of Transportation Systems (3) I, Sperling
Lecture—3 hours. Prerequisite: course 161 or consent of instructor. Technological, service quality, and operational characteristics of transportation systems. Definition and quantification of variables important to planning and systems design. Nature and principles influencing system characteristics. Introduction to methods of analyzing transportation systems. Offered in even-numbered years.

256. Transportation Impact Assessment (3) III. Kitamura
Lecture—3 hours. Prerequisite: course 160. Discussions, readings, and quantitative analysis of the impacts of transportation systems on society. Topics include urban land use, regional development, environmental quality, and energy consumption. Offered in even-numbered years.

257. Operations of Transportation Systems (3) III. Lam
Lecture—3 hours. Prerequisite: course 161. Stochastic modeling of transportation systems and analysis of system operations. Detailed study of system components including vehicle movements, terminals, and control subsystems. Application of mathematical tools to designing efficient system operations for various modes of transportation. Offered in odd-numbered years.

258. Transportation Networks (3) I, Lam
Lecture—3 hours. Prerequisite: course 153. Mathematical abstraction of transportation systems. Network flow analysis. System performance of a transportation network. Optimization problems of network design and network flow. Continuum treatment of transportation networks. Offered in odd-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.

268. Economics of Water Resources Planning (3) I. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: Engineering 106 or Agricultural Economics 148; course 152 and Economics 1A recommended. The value of water and evaluation of project alternatives. The uniqueness of water in microeconomic theory. The relation of traditional methods such as benefit cost analysis to multiobjective optimization and utility theory in evaluating non-commensurable objectives.

269. Hydroelectric Power and Water Supply Planning (3) II. Johnson
Lecture—3 hours. Prerequisite: courses 142, 152; 270 (concurrently). Hydropower: capacity and energy determination; duration curve analysis; load patterns; power generation simulation; estimating economic value-market analysis; institutional and regulatory considerations. Water supply: water demand determination; surface and ground water yield and reliability; water balances; water conservation.

***270. Advanced Water Resources Planning** (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: courses 142, 152, and 153 (may be taken concurrently) or consent of instructor. Philosophy and history of planning. Descriptive structure of plans and procedures to formulate plans. Advanced topics in institutional analysis, decision theory, data management, value theory and mathematical modeling.

270L. Water Resources Planning Laboratory (3) III. Johnson
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 270. Application of hydrology, hydraulics, economics, systems analysis and planning in conducting a water resources planning study for water supply, water recreation, flood control, water quality and urban renewal. Lectures provide background and guidance to utilize computer models and advanced planning techniques for class project.

272A. Advanced Groundwater Hydrology (3) I, Mariño
Lecture—3 hours. Prerequisite: course 144 or the equivalent; Mathematics 118A recommended. Fundamental equations of groundwater flow. Flow is confined, unconfined, and leaky aquifers. Hydrologic maps and flow nets. Hydraulics of pumping and recharging wells. Identification of aquifer parameters.

272B. Advanced Groundwater Hydrology (3) II. Mariño
Lecture—3 hours. Prerequisite: course 272A. Numerical methods of fluid flow systems. Flow in the unsaturated zone. Hydrodynamic dispersion. Fresh-water and salt-water interface in coastal aquifers. Identification of regional aquifer parameters. Modeling of aquifer systems. Offered in even-numbered years.

273. Water Resource Systems Engineering (3) II. Mariño
Lecture—3 hours. Prerequisite: course 153, Mathematics 131 or Statistics 131A, or consent of instructor. Optimization procedures used to evaluate the many alternative courses of action in designing and operating water resource systems; selection of the best possible solutions and alternatives.

274. Hydraulics of Pipe Lines (3) I, Larock
Lecture—3 hours. Prerequisite: course 141; Engineering 5. Mechanics of liquid flow in pipes and pipe network systems. Steady flow, unsteady flow, surge and water-hammer problems. Manifold flow. Offered in odd-numbered years.

275. Stochastic Hydrology (3) III. The Staff
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. The Staff
Lecture—3 hours. Prerequisite: course 142 or Water Science 141 or the equivalent; Mathematics 22A, 22B, 22C, 21C. 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. King
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.

278. Hydrodynamics (3) II. Larock
Lecture—3 hours. Prerequisite: course 141, Mathematics 185A, or the equivalent. Equations for conservation of mass, momentum, energy. Vorticity, circulation. Stream functions, velocity potential. Flows by superposition and conformal mapping. Free streamline applications, gravity effects, introduction to wave motion. Offered in odd-numbered years.

279. Advanced Mechanics of Fluids (4) I, Larock
Lecture—4 hours. Prerequisite: course 141. Rotational flows. Navier-Stokes equations and solutions for laminar flow; boundary layer equations and solution techniques. Nature of turbulence. Reynolds equations. Introduction to turbulence modeling. Offered in even-numbered years.

281. Advanced Soil Mechanics (3) I, Arulanandan
Lecture—3 hours. Prerequisite: course 171. Consolidation, shear strength and analysis of slope stability problems.

282. Advanced Soil Mechanics Laboratory (3) II. Shen
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 281. Subsurface exploration, advanced laboratory techniques including consolidation, shear strength, pore water pressure measurement, pavement design tests, *in situ* tests. Offered in even-numbered years.

283. Physicochemical Properties of Soils and Soil Behavior (3) I, Arulanandan
Lecture—3 hours. Prerequisite: course 171. Analysis of the mechanical behavior of soils from consideration of clay mineralogy, colloidal phenomena, ion-exchange and soil-water characteristics. Conduction phenomena, deformation mechanisms, strength, swelling, compaction and erosion. Microscopic theories to explain yielding of soils.

284. Theoretical Soil Mechanics (3) II. Cheney
Lecture—3 hours. Prerequisite: course 171. Unified theory of stress-strain behavior of soil, consolidation and rate of settlement, interpretation of laboratory tests, drained and undrained strength of soil, anisotropy, and time dependent behavior.

285. Pavement Design and Soil Stabilization (3) II. Shen
Lecture—3 hours. Prerequisite: course 171. Principles and methods of pavement design for highway and airport pavements; purposes, principles and methods of soil stabilization in foundation engineering. Offered in odd-numbered years.

286. Advanced Foundation Design (3) III. Shen
Lecture—3 hours. Prerequisite: course 173. Design and analysis of bulkheads; deep excavation; tie-back systems; tunnelling in soft ground; loads on buried conduits; lateral pile loading capacity; pier foundations; additional topics of footing and raft design.

287. Dynamic Response of Soils (3) III. Arulanandan
Lecture—3 hours. Prerequisite: course 171. Seismic survey, dynamic soil properties, analysis of the behavior of soils under earthquake conditions; applications to liquefaction, seismic response of soil deposits; earth dams and other structures.

289A-J. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Directed group study of special topics with separate sections in **(A)** Environment Engineering; **(B)** Hydraulics and Hydrologic Engineering; **(C)** Engineering Planning; **(D)** Geotechnical Engineering; **(E)** Structural Engineering; **(F)** Structural Mechanics; **(G)** Transportation Engineering; **(H)** Transportation Planning; **(I)** Water Resources Engineering; **(J)** Water Resources Planning. May be repeated for credit.

290. Seminar (1) I, II, III. The Staff (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)
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.)

NOTE: For key to footnote symbols, see page 123.

Engineering: Electrical and Computer

(College of Engineering)

V. Ralph Algazi, Ph.D., Chairperson of the Department

John N. Churchill, Ph.D., Associate Chairperson of the Department

Richard F. Walters, Ph.D., Associate Chairperson of the Department

Department Office, 3026 Bainer Hall (752-0583)

Faculty

V. Ralph Algazi, Ph.D., Professor
George R. Branner, Ph.D., Associate Professor
John N. Churchill, Ph.D., Professor
K. Wayne Current, Ph.D., Associate Professor
Andrew J. Dienes, Ph.D., Professor
Richard C. Dorf, Ph.D., Professor
(Electrical and Computer Engineering, Administration)
Herman J. Fink, Ph.D., Professor
Gary E. Ford, Ph.D., Associate Professor
William A. Gardner, Ph.D., Professor
Mohammed S. Ghausi, Ph.D., Professor
Stephen B. Haley, Ph.D., Associate Professor
Tien C. Hsia, Ph.D., Professor
A. K. Jain, Ph.D., Professor
Wen C. Lin, Ph.D., Professor
Norman S. Matloff, Ph.D., Associate Professor
(Electrical and Computer Engineering, Statistics)
John B. Powers, Ph.D., Professor Emeritus
Michael A. Soderstrand, Ph.D., Associate Professor
Ronald F. Soohoo, Ph.D., Professor
Jerome J. Suran, Ph.D. (hon.), Senior Lecturer
(Electrical and Computer Engineering, Administration)

Division of Engineering Computer Science

Richard F. Walters, Ph.D., Acting Chairperson of the Division

Division Office, 4455 Chemistry Annex (752-7004)

Faculty

Joseph Faletti, A.B., Acting Assistant Professor
Gene L. Fisher, B.S., B.A., Acting Assistant Professor
Kenneth I. Joy, Ph.D., Assistant Professor
Lawrence T. Kou, Ph.D., Professor
Peter Linz, Ph.D., Professor
Charles U. Martel, Ph.D., Assistant Professor
Manfred Ruschitzka, Ph.D., Associate Professor
Richard F. Walters, Ph.D., Professor

Note: Courses in Computer Science Engineering are listed below immediately following the courses in Engineering: Electrical and Computer. For a related major, see Computer Science and Mathematics on page 164. Major programs in the Department of Electrical and Computer Engineering begin on page 183.

Courses in Engineering: Electrical and Computer

Lower Division Courses

1. Introduction to Electrical and Computer Engineering (1) III. The Staff (Chairperson in charge)
Lecture—1 hour. Electrical and computer engineering as a professional activity. What electrical engineers know and how they use their knowledge. Problems they are concerned with and how they go about solving them. Presentation of basic ideas and their applications. Examination of some case studies. (P/NP grading only.)

8ATA. Self-Paced Introduction to Computer Programming: PASCAL (2) I, II, III. The Staff
Workshop—6 hours. Prerequisite: Mathematics 16A or 21A (may be taken concurrently). First of a two part self-paced introductory programming sequence teaching PASCAL with emphasis on algorithms, their design and efficiency. Basic programming design, running, debugging and testing of programs. Students who have had Engineering 5, 5ATA, Computer Science Engineering 8, 80, or 88 may not receive credit for this course; and those who have had Computer Science Engineering 20 may receive only 1 unit of credit.

8ATB. Self-Paced Introduction to Computer Programming: PASCAL (1) I, II, III. The Staff
Workshop—3 hours. Prerequisite: course 8ATA. Sequel to course 8ATA. Self-paced continuation of the introduction to computer programming teaching PASCAL with emphasis on problem solving. Topics covered include arrays and recursion. Students who have had Engineering 5, 5ATA, Computer Science Engineering 8, 80, or 88 may not receive credit for this course.

89A-O. Special Topics in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in **(A)** Biomedical Engineering; **(B)** Computer Science; **(C)** Programming Systems; **(D)** Digital Systems; **(E)** Communications; **(F)** Control Systems; **(G)** Signal Processing; **(H)** High-Frequency Phenomena and Devices; **(I)** Solid-State Devices and Physical Electronics; **(J)** Systems; **(K)** Circuits; **(L)** Computer Software; **(M)** Computer Hardware; **(N)** Microprocessing; **(O)** Electronics. May be repeated for credit when the topic is different.

92. Internship in Electrical and Computer Engineering (1.5) I, II, II. The Staff (Chairperson in charge)
Work-learn experience—3-15 hours. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work-study experience in Electrical and Computer Engineering. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (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.)

Upper Division Courses

105AT. Self-Paced Advanced Course in Computer Programming in FORTRAN 77 (1) I, II, III. The Staff
Workshop—3 hours. Prerequisite: Engineering 5 (or the equivalent); upper-division standing. Course covers advanced I/O and involves design and implementation of a substantial programming project. Projects may be selected from student's own field of application.

110. Electronic Circuits (4) III. Churchill, Haley
Lecture—4 hours. Prerequisite: course 111 (concurrently), 112, 140 and Engineering 100. Large and small signal device models; analysis and design of linear circuits, both discrete and integrated forms; analysis and design of nonlinear, digital and pulse circuits.

111. Electronic Circuits Laboratory (3) III. Churchill, Haley
Laboratory—9 hours. Prerequisite: courses 110 (concurrently), 140. Projects on the design, analysis and evaluation of elementary transistor circuits, amplifiers, operational amplifiers, feedback circuits and digital circuits.

112. Linear Systems and Circuits (4) II. Ford, Algazi
Lecture—4 hours. Prerequisite: Engineering 17; Mathematics 22A. Characterization and analysis of linear systems and circuits. Time domain analysis by convolution techniques. Emphasis on frenquency domain techniques, including Laplace transform, Fourier transform and Fourier series, with applications to electrical circuits.

114A. Bipolar Integrated Circuit Applications (3) I, Churchill, Current
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110, 111. Analysis and design of bipolar monolithic integrated circuits emphasizing circuit and system aspects rather than fabrication.

114B. MOS Integrated Circuit Applications (3) II. Churchill, Current
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110, 111. Metal-oxide semiconductor (MOS) integrated circuits and applications, dynamic and static memory and logic circuits, large-scale integrated random logic, read-only memory (ROM), programmable read-only memory (PROM), random-access memory (RAM), and shift registers.

115A. Integrated Circuits Design Technology (3) I, Churchill, Current
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 140. Various phases of integrated circuit design and fabrication are considered. Laboratory projects are used to develop skills in the most important techniques of integrated circuit fabrication.

115B. Bipolar Integrated Circuits Design and Fabrication Laboratory (3) II. Churchill, Current
Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 140 and 115A. Design fabrication and testing of bipolar and/or metal-oxide-semiconductor devices and integrated circuits. Typical projects might include operational amplifier, digital logic system, or simple feedback control systems.

130A. Introductory Electromagnetics (3) I. Dienes, Fink
Lecture—3 hours. Prerequisite: Mathematics 22B and 22C; Physics 8B strongly recommended. Static electric and magnetic fields; time-varying electromagnetics.

130B. Introductory Electromagnetics (3) II. Fink, Dienes
Lecture—3 hours. Prerequisite: course 130A and Engineering 17. Plane electromagnetic waves, transmission, reflection; transmission lines.

131A. Electromagnetic Fields and Waves (3) I, Fink, Dienes
Lecture—3 hours. Prerequisite: course 130B or the equivalent. Propagation and reflection of plane waves in isotropic media. Guided electromagnetic waves. Rectangular and circular wave guides.

131B. Electromagnetic Fields and Waves (3) II. Fink, Dienes
Lecture—3 hours. Prerequisite: course 131A or the equivalent. Fiber optics. Helix and slow-wave structures. Wave propagation in media with anisotropic permittivity and permeability, and on plasmas. Travelling wave amplifier.

131C. Electromagnetic Fields and Waves (3) III. Fink, Dienes
Lecture—3 hours. Prerequisite: course 131B or the equivalent. Resonant cavities; microwave networks and components; antennas.

132A. High-Frequency Systems, Circuits and Devices (4) I. Branner
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 130B. Application of electromagnetic theory to analysis and design of practical devices, circuits and systems operating at radio frequencies. Energy transfer at high frequencies, transmission lines, microwave integrated circuits, circuit analysis of electromagnetic energy transfer systems, the scattering parameters.

132B. High-Frequency Systems, Circuits and Devices (4) II. Branner
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 132A. Passive high-frequency device, analysis, design. Microwave circuit and filter design. Analysis and design of microwave transistor and tunnel diode amplifiers, antenna analysis and design to include thin linear, loop, cylindrical, waveguide and horn, and phased array antennas.

***134. Radar Systems and Signals** (3) II. Branner
Lecture—3 hours. Prerequisite: course 112; course 160 strongly recommended. Introductory course on radar systems and signals. Emphasis on analysis of practical radar system configurations and signals. The prediction of radar range performance, accuracy and resolution is discussed for a number of radar classes including: pulse, cw and pulse doppler.

140. Fundamental Principles of Device Physics (4) II. Churchill, Haley
Lecture—4 hours. Prerequisite: course 130A and Physics 8B. Semiconductor device fundamentals: equilibrium and non-equilibrium statistical mechanics, conductivity, diffusion, density of states, electrons and holes, p-n junctions and bipolar transistors; magnetic device fundamentals: origin of magnetism, magnetic materials, devices.

145A. Solid-State Electronics (3) III. Churchill, Soohoo, Haley
Lecture—3 hours. Prerequisite: course 140. Electrical properties and design of various semiconductor devices. Devices to be discussed include metal-semiconductor diodes, PN junction diodes, and bipolar transistors.

145B. Solid-State Electronics (3) I, Churchill, Soohoo, Haley
Lecture—3 hours. Prerequisite: course 145A. Electrical properties and design of various semiconductor devices. Devices to be discussed include field-effect transistors, and bulk negative resistance devices.

145C. Solid-State Electronics (3) II. Churchill, Soohoo
Lecture—3 hours. Prerequisite: course 145A. Design of devices and their associated circuits utilizing the magnetic properties of solids. Devices studied include the ferrite core, ferrite isolator, magnetic media used in disk, tape and bubbles and masers and lasers.

148. Superconductivity (3) I, Fink
Lecture—3 hours. Prerequisite: course 130B or course 140 or the equivalent. Fundamental properties of superconductors of the first and second kind, London and Ginzburg-Landau theories, Josephson effects, applications and devices.

NOTE: For key to footnote symbols, see page 123.

150. Microprocessor-Based Instrumentation Systems (4) II. Soderstrand
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 170 and Engineering 100. Typical uses of microprocessors and microprocessor development systems in instrumentation applications. Analytical and design methods common to modern instrumentation systems including: transducers, dynamic reponse, signal conditioning, A/D conversion, data transmission, hardware interfacing, software development, noise and safety.

151. Discrete Time Systems (3) I, Hsia, Ford
Lecture—3 hours. Prerequisite: course 112. Characterization, analysis, and design of discrete time systems. Difference equation models. Z-transform analysis methods. Introduction to digital filter design. Discrete and fast Fourier transforms.

157A. Control Systems (3) II. Hsia, Dorf
Lecture—3 hours. Prerequisite: course 112. Design and analysis of closed loop automatic control systems. Examples are drawn from all engineering fields. The mathematical representation of systems; frequency, s-plane and state space methods; stability criteria.

157B. Control Systems (3) III. Hsia, Dorf
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 157A. Control system optimization and compensation techniques, digital control theory. Laboratory includes Servo system experiments and computer simulation studies.

160. Fourier Analysis and Modulation (3) III. Gardner, Ford
Lecture—3 hours. Prerequisite: course 112. Fourier analysis of signals. Applications to analysis and design of linear time invariant systems, and nonlinear and time varying circuits for filtering, sampling and modulation.

161. Signal Processing (3) II. Ford
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 151; Engineering 100. Design and implementation of analog and digital signal processing systems. Topics include: filtering, spectral analysis, function circuits, A/D and D/A conversion, and digital communication systems.

165. Data Communication (3) II. Gardner, Ford
Lecture—3 hours. Prerequisite: course 160, Engineering 118. Introduction to data communication systems. Analysis of effect of modulation on signal corruption by noise. Techniques for high speed digital data transmission. Introduction to information theory.

170. Computer Structure and Assembly Language (4) I, II, III. Lin, Kou
Lecture—3 hours; computer workshop—3 hours. Prerequisite: proficiency in at least one higher-level programming language. Introduction to computer architecture; machine language; assembly language; macros and conditional assembly; input-output programming, absolute and relocatable code; re-entrant code; assemblers and loaders.

171. Introduction to Computer Architecture (4) III. Lin, Kou
Lecture—3 hours; discussion—1 hour. Prerequisite: course 170. Study of architectural features of several representative computers, large, mini and micro, including instruction format, addressing, details of instruction operation, input-output and interrupts. Study of microprogrammable machines.

172. Microcomputer-Based Systems Design (4) I, II. Lin
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 170, 176; course 177 (concurrently) recommended. Studies of different types of microcomputers; comparison and selection of microprocessor for goal-oriented applications; systems design procedures; peripheral chips; interface design; microcomputer system software; typical application-oriented design projects.

175. Computer Devices and Systems (3) III. Soohoo
Lecture—3 hours. Prerequisite: course 140. Essential elements of the computer and their interdependence. Characteristics of input and output devices, memories and CPU (central processing unit) including discussion of discs, cores, magnetic bubbles, CCD's (charge-coupled devices) and microprocessors.

176. Digital Systems I (4) III
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 100. Introduction to digital system design, including computer arithmetic, combinational circuit design, sequential and asynchronous circuits and memory system design.

177. Digital Systems II (4) I, Lin
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 110, 176. Introduction to design of multi-input system controllers, use of MSI/LSI in controller design, design of programmable system controllers, use of A/D and D/A and common problems in system design such as noise.

180. Data Structures and Programming Techniques (4) II, III. Martel
Lecture—3 hours; programming practice workshop—3 hours. Prerequisite: course 170, Computer Science Engineering 80 (advanced features of PASCAL) or consent of instructor. Concept of data-type, arrays, records, set structures and their representation. Sequential file structures. Dynamic information structures: linear lists, tree structures. Hash techniques; recursive algorithms; sorting and searching.

181. Compiler Design (4) III. The Staff
Lecture—3 hours; workshop—3 hours to be arranged. Prerequisite: course 180. Survey of various programming language features and translators. Emphasis on formal language specifications, lexical analysis, syntax analysis and syntax directed translation.

182A. Operating System Design (4) I, Ruschitzka
Programming workshop—3 hours. Prerequisite: courses 171, 181. Architectural support of operating system concepts; systems programming; major components of an operating system, their functions, and their interactions. Lecture material coupled with programming project that involves a machine simulator and the implementation of matching multiprogramming system.

182B. Operating System Design (3) II. Ruschitzka
Lecture—3 hours. Prerequisite: course 182A; introductory probability theory course. Contemporary architectures: virtual memory and operating system support functions. Concurrent processes and problems of determinacy, mutual exclusion, deadlocks, and synchronization; management of physical and virtual resources. Protection mechanisms. User interface and ease-of-use considerations.

185. Database Systems (4) II. Kou
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 180. Storage and retrieval of information; file organization; file utilization: efficiency, security, integrity; file oriented languages. Introduction to database systems.

186. Modeling and Simulation of Computer Systems (3) III. Matloff
Lecture—3 hours. Prerequisite: Computer Science Engineering 80, course 170, and a calculus-based probability course. Introduction to queuing theory. Techniques for developing simulation software. Applications to the design of computer systems, such as processor scheduling, memory management and file systems.

189A-O. Special Topics in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in **(A)** Biomedical Engineering; **(B)** Computer Science; **(C)** Programming Systems; **(D)** Digital Systems; **(E)** Communications; **(F)** Control Systems; **(G)** Signal Processing; **(H)** High-Frequency Phenomena and Devices; **(I)** Solid-State Devices and Physical Electronics; **(J)** Systems; **(K)** Circuits; **(L)** Computer Software; **(M)** Computer Hardware; **(N)** Microprocessing; **(O)** Electronics. May be repeated for credit when the topic is different.

190C. Research Group Conferences in Electrical and Computer Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper division standing in Electrical and Computer Engineering; consent of instructor. May be repeated for credit. (P/NP grading only.)

***191. Discrete Structures and their Applications** (3) I, Kou
Lecture—3 hours. Prerequisite: three-quarter sequence of a lower division mathematics course; course 170. Discrete structures and applications to various areas of computer science; mathematical models and mathematical reasoning; sets, relations, functions; application to data structures; semigroups; monoids; groups; lattices; Boolean algebra. Their use in coding theory, computer design, automata theory and formal languages.

192. Internship in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Work-learn experience—3-15 hours. Prerequisite: completion of a minimum of 84 units; project approval prior to period of internship. Supervised work-study experience in electrical and computer engineering. May be repeated for credit. (P/NP grading only.)

198. 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.)

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. Hsia, Jain
Lecture—3 hours. Prerequisite: knowledge of FORTRAN programming and graduate status. Computer-aided optimization of single-variable and multi-variable functions with and without constraints. Preplanned and sequential search methods. Gradient methods. Linear and nonlinear programming Typical applications in different disciplines. Offered in odd-numbered years.

202. Optimization of Dynamic Systems (3) III. Hsia
Lecture—3 hours. Prerequisite: course 212. Introduction to dynamic system optimization techniques with applications. Calculus of variations, maximum principle, dynamic programming. Applications to various optimization problems in system engineering. Offered in odd-numbered years.

204. Digital Processing of Signals (4) II. Algazi, Jain
Lecture—4 hours. Prerequisite: course 151. Theory and applications of digital processing of signals. Recursive and non-recursive digital filter design techniques, analysis of quantization effects. Homomorphic signal processing.

206. Digital Image Processing (3) I, Jain
Lecture—2 hours; laboratory—3 hours. Prerequisite: knowledge of FORTRAN; senior students with consent of instructor. Mathematical representation of images, transform theory and applications, image enhancement and applications, data compression and techniques for digital image transmission and storage. Special topics dealing with applications and laboratory projects are also included.

207. Pattern Recognition and Classification (3) III. Ford
Lecture—3 hours. Prerequisite: Statistics 131A or Mathematics 131, or the equivalent. Topics in statistical pattern recognition: Bayes decision theory; parameter estimation and supervised learning; non-parametric techniques; linear discriminant functions; unsupervised learning and clustering; feature extraction. Applications to image processing.

208. Advanced Image Processing (4) III. Jain
Lecture—4 hours. Prerequisite: course 206. Fundamentals developed in course 206 are applied to problems in image processing. Topics discussed include stochastic image representation, image restoration, image reconstruction from projections, image analysis and image data compression. Offered in even-numbered years.

210A. Advanced Electronic Circuits Linear Amplifiers (3) II. Current, Churchill, Haley
Lecture—3 hours. Prerequisite: courses 110, 111. In-depth analysis of linear amplifiers. Designs are undertaken using Bode analysis, compensation, and root locus techniques. Computer-aided analysis is used extensively.

210B. Introduction to VLSI Circuits (3) III. Current, Churchill
Lecture—3 hours. Prerequisite: courses 110, 111. Theory and practice of VLSI circuit and system design. Extensive use of VLSI computer-aided design aids allow students to undertake a VLSI design example.

212. System Analysis (4) I, Hsia
Lecture—4 hours. Prerequisite: courses 112, 151. Analysis of continuous-time and discrete-time linear systems; state space techniques introduced as the major methodology for system analysis.

214. Computer-Aided Circuit Analysis and Design (3) III. Current, Haley
Lecture—3 hours. Prerequisite: course 110. Network equation formulations; numerical techniques for ac, dc, and transient solutions for linear and nonlinear networks; sensitivities and automated design; device models; and practical design problems using SPICE.

215. Advanced Projects in IC Fabrication (3) III. Churchill, Current
Discussion—1 hour; laboratory—6 hours. Prerequisite: course 115B. Individualized projects in the fabrication of analog or digital integrated circuits.

***220. Network Synthesis** (3) I, Soderstrand, Current
Lecture—3 hours. Prerequisite: course 112. An introduction to modern active and passive network synthesis techniques. Topics include: one- and two-port networks, realization procedures, and filter theory. Emphasis is on modern techniques which lead to doubly terminated reactance two-port synthesis.

221. Passive Filter Design (3) II. Soderstrand
Lecture—3 hours. Prerequisite: course 220 or the equivalent. An introduction to the design of passive filters with lumped and distributed elements. Filter specification and design process, reactance transformations, approximation theory, passive filters with lumped elements, crystal and ceramic filters, mechanical filters, microwave filters.

222. Active Filter Design (3) III. Soderstrand
Lecture—3 hours. Prerequisite: course 220 or the equivalent. An introduction to the design of active filters with lumped, distributed elements, and switches. Active filters with lumped RC networks, active distributed RC networks, switched filters, n-path filters.

226A. Quantum Electronics (3) I, Dienes, Fink
Lecture—3 hours. Prerequisite: courses 130B and 140 or the equivalent. Some basic concepts of quantum theory, density operator. Hamiltonian, and parity. Electric dipole transition; equation of motion of magnetic dipole; resonant processes, absorption, dispersion and saturation; transient behavior of electric dipole transitions, coupled amplitude equations and rate equations. Offered in even-numbered years.

226B. Quantum Electronics (3) II. Dienes, Fink
Lecture—3 hours. Prerequisite: course 226A. Lasers, masers: population inversion, threshold requirement, steady-state and transient behavior, Q-switching. Interaction between radiation and phonons. Offered in odd-numbered years.

NOTE: For key to footnote symbols, see page 123.

***227A. Microwave Electronics** (3) I, Soohoo
Lecture—3 hours. Prerequisite: courses 130B and 140 or the equivalent. Theory of microwaves, waveguides and cavities. Interaction between electromagnetic fields and the electron charge. Lorentz force law, energy levels in matter and Zeeman splitting. Comparison between conventional and microwave tubes and other new types of microwave oscillators and amplifiers. Offered in odd-numbered years.

***227B. Microwave Electronics** (3) II. Soohoo
Lecture—3 hours. Prerequisite: course 227A or the equivalent. Theory of interaction between electromagnetic fields and electronic charge, with applications to electron beam and solid-state devices. Beam formation, velocity and density modulation, plasma oscillation, space charge wave propagation in klystrons. Parametric amplifiers, tunnel and IMPATT diodes, Gunn oscillators. Offered in even-numbered years.

228. Advanced Microwave and Antenna Design Techniques (3) III. Branner
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 132A-132B or 131B. Design, fabrication and analysis of advanced microwave devices and antennas. Includes GaAs FET amplifiers, broadband microstrip and stripline filters, 180 ° hybrids, beamformers and tapered networks. Antenna design and analysis of horns, microstrip antennas, log periodic radiators, arrays, equiangular spirals and reflectors.

231. Electromagnetic Theory (3) II. Dienes, Fink
Lecture—3 hours. Prerequisite: course 131B and Engineering: Applied Science 234A. Advanced topics in electromagnetics, including propagation in anisotropic and nonlinear media.

245A. Applied Solid-State Physics (3) I, Fink, Soohoo, Churchill, Haley
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, Haley
Lecture—3 hours. Prerequisite: course 245A. Theory of semiconductors with application to transistors. Topics include electrons, holes, mobility, and transistor circuitry. Brief discussion of superconductivity and superconducting solenoids. Offered in odd-numbered years.

***245C. Applied Solid-State Physics** (3) III. Fink, Soohoo
Lecture—3 hours. Prerequisite: course 245A. Theory of magnetism in solids, with application to ferromagnetic devices and circuits. Topics include paramagnetism, ferromagnetism, magnetic resonance, and switching properties of individual magnetic elements and magnetic arrays. Offered in even-numbered years.

246. Advanced Semiconductor Devices (3) III. Churchill, Haley
Lecture—3 hours. Prerequisite: course 145B. Physical principles and characteristics of various semiconductor devices such as: junction field effect transistor, silicon controlled rectifier, metal-insulater-semiconductor diodes, insulated gate field effect transistors, thin film devices, optoelectronic devices, and change-coupled devices.

***251. Nonlinear Control Systems** (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: courses 157B and 212. Techniques for solving nonlinear control problems; state space methods, stability theorems; Lyapunov's methods; sinusoidal describing function and on-off systems. Offered in even-numbered years.

253. Adaptive Systems (3) I, Hsia
Lecture—3 hours. Prerequisite: courses 151 and 212 or the equivalent. Theory and practice of adaptive systems. Concepts of learning and adaptation. Structure of adaptive system and the related adaptive algorithms. Applications to adaptive filters design, system identification, and adaptive control.

254. Digital and Sampled-Data Control System (3) II. Hsia
Lecture—3 hours. Prerequisite: courses 157A, 212, or the equivalent. Major topics in digital and sampled data control theory with applications to computer control system analysis and design. Frequency domain (z-transform) methods, state space methods and statistical design methods. Offered in even-numbered years.

260. Spectrum Analysis (4) III. Gardner
Lecture—3 hours; discussion—1 hour. Prerequisite: undergraduate course on linear systems and Fourier analysis (e.g., courses 112 and/or 160). Theory and methodology of empirical spectral analysis of random signals. Fundamentals of resolution, reliability, measurement and computation, and hidden periodicity. Applications to system identification, signal detection, signal extraction, and the characterization of modulated signals.

270. Finite-State Machines (3) III. Kou
Lecture—3 hours. Prerequisite: course 191. A study of finite-state sequential machine models and behavior; experiments; the Regular Algebra; algebraic structure theory of finite-state machines; completeness of sets of primatives. Offered in odd-numbered years.

271. Advanced Digital System Design (4) II. Lin
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 177. Topics in advanced design of arithmetic processors. High-speed addition, multiplication and division. Floating point processors. Pipeline processors. Laboratory involving design and construction of several example systems.

***272. Advanced Switching Theory** (3) III. The Staff (Kou in charge)
Lecture—3 hours. Prerequisite: courses 171, 191. Topics in switching theory. Synchronous and asynchronous sequential circuits. Theoretical study of Boolean functions and their transforms. Special realization techniques for combinational and sequential circuits. Offered in even-numbered years.

273. Bit-Slice Microprocessor Systems (3) III. Lin
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 172. Literature search and comparison of most popular bit-slice microprocessors. Microprogramming based on Wilkes model. Microprogram control technique and state machine concept for digital logic design. Machine emulation.

274. Advanced Computer Architecture (3) I, Ruschitzka
Lecture—3 hours. Prerequisite: course 271 or consent of instructor. A study of computer architectures of advanced scientific computers. CDC 6000, 7000 series architecture. Illiac IV architecture. Pipeline array processor architecture. Offered in even-numbered years.

275. Computer Graphics (3) II. Joy
Lecture—3 hours. Prerequisite: course 180. Study of 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.

***276A. Introduction to Fault-Tolerant Computing** (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 176. Examination of current issues in design and analysis of fault-tolerant digital systems. Course covers basic fault-tolerant architectures such as NMR, Hybrid, and Fail-Soft as well as reliability analysis, system diagnosis, and software fault-tolerance.

***276B. Introduction to Digital Fault Diagnosis** (3) I. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 176; Engineering 118. A review of several current techniques used to diagnose faults in both combinational and sequential circuits. Topics include path sensitization procedures, Boolean difference, D-algorithm random test generation, TC testing and an analysis of the effects of intermittent faults.

277A. Design and Analysis of Algorithms (3) I, Martel
Lecture—3 hours. Prerequisite: courses 180 and 191 or the equivalent; Computer Science Engineering 123 and Statistics 131A recommended. Techniques for designing efficient algorithms and analyzing their complexity. Use of data structures. Counting and estimating. Search techniques. Graph algorithms. The classes P and NP.

277B. Advanced Design and Analysis of Algorithms (3) II. Martel
Lecture—3 hours. Prerequisite: course 277A. Advanced topics in complexity theory. Problem classification. The classes P, NP, P-space, Co-Np. Matching and network flow algorithms. Matrix multiplication. Approximation algorithms. Selected advanced topics. Offered in even-numbered years.

***278A. Formal Languages and Related Automata** (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 191 or consent of instructor. Classes of formal languages and their grammars, important classes of finite and infinite automata and their properties. Correspondence between these classes and types of formal grammars. Emphasis on context-free languages.

278B. Translation of Programming Languages (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: courses 180, 181 and 278A. Compilation process. Storage allocation. Object code generation. Boot strapping. Parsing techniques. Table-driven compilers. Optimization techniques.

278C. Code Generation and Optimization (3) III. The Staff
Lecture—3 hours. Prerequisite: course 278B. Object code generation techniques; representations of intermediate code; local and global register allocation; optimization techniques; data flow analysis; code movement; loop optimization; common subexpression elimination; peephole optimization.

***279. Artificial Intelligence** (3) II. Faletti
Lecture—3 hours. Heuristic programming. Representation of knowledge. Problem solving methods. Game playing. Machine perception of three-dimensional space. Theorem proving. Semantic information processing.

280. Database Systems (3) III. Kou
Lecture—3 hours. Prerequisite: course 185. Survey and discussion on major issues in current database systems. Topics include: data models, storage management and access methods, query languages and query optimizations, database integrity and security, encryption and decryption techniques, transaction and concurrency control.

282. Operating System Models (3) III. Ruschitzka
Lecture—3 hours. Prerequisite: course 182B; introductory probability theory course. Survey of formal models that are used in study of operating systems. Modeling of parallel processes and their synchronization in terms of partial orderings and Petri nets. Deterministic and probabilistic models for the evaluation of system performance measures.

283. Random Signals and Noise (4) II. Gardner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 160 and Mathematics 131 or Statistics 131A, or the equivalent. Random processes as probabilistic models for signals and noise. Review of probability, random variables, and expectation. Study of correlation function and spectral density, mean square calculus, ergodicity, optimum Wiener and Kalman filtering.

284. Estimation and Detection of Signals in Noise (3) III. Gardner, Algazi
Lecture—3 hours. Prerequisite: Mathematics 131 or Statistics 131A, or the equivalent; course 283 recommended. Application of probablistic and statistical methods and models to detection and estimation of signals in noise. Classical parameter estimation and decision theory. Extension of classical techniques for finite variables to continuous parameter processes. Application to estimation of signal parameters, detection of signals.

285. Information Theory and Coding (3) III. Algazi, Gardner
Lecture—3 hours. Prerequisite: Statistics 131A or the equivalent. Information theory and coding. Measure of information. Redundancy reduction encoding of an information source. Capacity of a communication channel, error-free communication. Linear block and convolutional codes.

289A-O. Special Topics in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in **(A)** Biomedical Engineering; **(B)** Computer Science; **(C)** Programming Systems; **(D)** Digital Systems; **(E)** Communications; **(F)** Control Systems; **(G)** Signal Processing; **(H)** High-Frequency Phenomena and Devices; **(I)** Solid-State Devices and Physical Electronics; **(J)** Systems; **(K)** Circuits; **(L)** Computer Software; **(M)** Computer Hardware; **(N)** Microprocessing; **(O)** Electronics. May be repeated for credit when the topic is different.

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.)

290C. Research Group Conferences in Electrical and Computer Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: consent of instructor; graduate standing. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Courses in Engineering Computer Science

Lower Division Courses

8. Introduction to Computer Programming: PASCAL (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: Mathematics 16A (may be taken concurrently). Introduction to digital computation and computer programming; algorithms, their design and efficiency. Basic programming design, running, debugging, testing of well-structured programs. Programming language PASCAL will be used to solve simple problems. Students who have had courses 80, 88, Engineering 5, 5ATA, or former Mathematics 29A may not receive credit for course 8; and those who have had course 20 or former mathematics 19 may receive only 2 units of credit.

20. Basic Concepts of Computing (3) I, II, III. The Staff
Laboratory—1 hour; lecture—2 hours. 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 who have had course 8, Engineering 5 or former Mathematics 29A may not receive credit for this course.

80. Introduction to Software Development (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 8. Elements of program design; programming style, documentation, efficiency,

NOTE: For key to footnote symbols, see page 123.

debugging, verification; advanced features of PASCAL, and introduction to FORTRAN. Students who take courses 8, 80, Engineering 5, 5ATA and/or 5ATB may receive up to a total of 7 units; and those who have had course 88 or former mathematics 29B may not receive credit for course 80.

88. Computer Programming: PASCAL (3) I, II, II. The Staff
Computer workshop—9 hours. Prerequisite: Mathematics 16A or 21A; Engineering 5. Self-paced computer programming course teaching PASCAL for graduate and transfer students with Engineering 5 or the equivalent background, or consent of instructor. Problem solving skills as well as PASCAL syntax emphasized. Students who have had course 8 or former Mathematics 29A may not receive credit for course 88.

Upper Division Courses

121. Introduction to Computer Organization (3) I. The Staff
Lecture—3 hours. Prerequisite: course 80. Basic principles of computer organization, machine language, number representation, logic design, arithmetic processors, memory, input-output devices. Not open for credit to students who have received credit for former mathematics 123.

123. Algorithm Design and Analysis (3) II. The Staff.
Lecture—3 hours. Prerequisite: course 80. Complexity of algorithms, bounds on complexity. Algorithms for searching, sorting, pattern matching, graph manipulation, combinational problems. Classification of problems and algorithms. NP-complete problems. Not open for credit to students who have completed former Mathematics 129B.

124. Programming Languages and Compilers (3) III. The Staff
Lecture—3 hours. Prerequisite: course 123. Syntactic definition of a language, grammars, syntactic and lexical analysis, parsing, code generation and optimization. Not open for credit to students who have completed former mathematics 129C.

125. Information Systems (3) I, Walters
Lecture—3 hours. Prerequisite: knowledge of programming in at least one high-level language, FORTRAN or ALGOL (preferred); upper division and graduate students only. Components of information systems, including hardware, software, economics and people; application to the solution of specific problems in creation, design and implementation of information systems. Not open for credit to students who have completed former Community health 151.

126. Automata Theory and Formal Languages (3) I. The Staff
Lecture—3 hours. Prerequisite: course 124. Finite automata and regular languages, context free languages, linear bounded automata and context sensitive languages. Turing machines. Computability. Not open for credit to students who have completed former mathematics 171.

127. Computer Graphics (3) I. The Staff
Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 180 or former Mathematics 129A. Introduction to the basic principles of computer graphics. Current graphics hardware, elementary operations in two- and three-dimensional space, matrices and transformational geometry, clipping, graphics system design, standard graphics systems, individual projects. Not open for credit to students who have completed former Mathematics 173.

128. Topics in Artificial Intelligence (3) I. The Staff
Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 180. Surveys current topics in artificial intelligence, and introduces the artificial intelligence language, LISP. Topics include knowledge and organization and representation, searching techniques, natural language understanding, expert systems, games, pattern matching, and theorem proving. Not open for credit to students who have completed former Mathematics 174.

129. Software Design (3) III. The Staff
Lecture—3 hours. Prerequisite: course 124. Surveys current topics in software design and testing. Topics include program structure design, design practices, programming style, testing principles, module testing, reliability, proving program correctness and software support systems. Not open for credit to students who have completed former Mathematics 176.

Engineering: Mechanical

(College of Engineering)

Charles W. Beadle, Ph.D., Chairperson of the Department

Department Office, 2020 Bainer Hall (752-0580)

Faculty

James W. Baughn, Ph.D., Professor
Charles W. Beadle, Ph.D., Professor
Harry Brandt, Ph.D., Professor
John W. Brewer, Ph.D., Professor
Stanley A. Brown, D.Engr., Associate Professor *(Orthopaedic Surgery)*
Harry A. Dwyer, Ph.D., Professor
Clyne F. Garland, M.S., Professor Emeritus
Warren H. Giedt, Ph.D., Professor Emeritus
John F. Gisla, J.D., Visiting Lecturer
William A. Hancock, Ph.C., Visiting Lecturer
Jerald M. Henderson, D.Engr., Professor *(Mechanical Engineering, Food Science and Technology)*
Ronald A. Hess, Ph.D., Associate Professor
Myron A. Hoffman, Sc.D., Professor
Mont Hubbard, Ph.D., Associate Professor
Maury L. Hull, Ph.D., Associate Professor
Alfred T. Jones, Ph.D., Associate Professor
Dean C. Karnopp, Ph.D., Professor
John D. Kemper, Ph.D., Professor
Wolfgang Kollmann, Dr-ing, Associate Professor
Chung K. Law, Ph.D., Professor
Arthur S. Leonard, M.S., Lecturer
Donald L. Margolis, Ph.D., Professor
Allan A. McKillop, Ph.D., Professor
Paul G. Migliore, Ph.D., Assistant Professor
Howard L. Needles, Ph.D., Professor *(Textiles and Clothing)*
John B. Stek, Ph.D., Visiting Lecturer
Bruce R. White, Ph.D., Associate Professor
[3,4]An Tzu Yang, D.E.Sc., Professor
S. Haig Zeronian, Ph.D., D.Sc., Professor *(Textiles and Clothing)*

Division of Materials Science and Engineering

Faculty

Jeffery C. Gibeling, Ph.D., Assistant Professor
[1]David G. Howitt, Ph.D., Associate Professor
Amiya K. Mukherjee, D.Phil., Professor
Zuhair A. Munir, Ph.D., Professor
James F. Shackelford, Ph.D., Associate Professor

Courses in Mechanical Engineering

Lower Division Courses

1. Mechanical Engineering (1) II. The Staff (Beadle in charge)
Lecture—1 hour. Description of the field of mechanical engineering with examples taken from industrial applications; discussion of the practice with respect to engineering principles, ethics and responsibilities. (P/NP grading only.)

92. Internship in Mechanical Engineering (1-5) I, II, III. The Staff (Beadle in charge)
Work-learn experience. Prerequisite: lower division standing; approval of project prior to period of internship. Supervised work-study experience in engineering. May be repeated for credit (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Beadle in charge)
Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

124. Mechanical Engineering Project (2) I, II, III. The Staff (Beadle in charge)
Laboratory—6 hours. Prerequisite: consent of instructor. Performance of projects which include design, development and evaluation of a mechanical engineering system or related experiments which give the student experience in theoretical modeling and experimental evaluation. May be repeated once for credit.

125. Aeronautical Engineering Fundamentals (3) I, Migliore
Lecture—3 hours. Prerequisite: Engineering 103A (may be taken concurrently). Aircraft subsystems and nomenclature. History and structure of the aviation industry. Design/development cycle. Fundamentals of aircraft aerodynamics, performance, stability and control, propulsion, structures, wind tunnel testing, flight simulators and flight testing.

126. Theoretical Aerodynamics (4) III. Kollmann
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B. Study of flow field kinematics and dynamics. Flow about a body. Thin airfoil theory. Finite wing theory. Application of numerical methods to wing design.

127. Applied Aircraft Aerodynamics (4) I, White
Lecture—3 hours; discussion—1 hour. Prerequisite: Course 126. Experimental characteristics of wing sections. High-lift devices. Lift and drag at high Mach numbers. Drag aerodynamics. Total aircraft drag estimation. Aerodynamic design procedures.

128. Aircraft Performance (4) II. Migliore
Lecture—3 hours; discussion—1 hour. Prerequisite: course 127. Aircraft propulsion systems and their performance characteristics. Methods for computing and presenting aircraft performance data. Modern techniques of numerical analysis and energy methods. Application of techniques to aircraft design.

129. Aircraft Stability and Control (4) II. Hess
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 102B. Aircraft static stability and control. Derivation and linearization of general equations of motion for aircraft. Longitudinal dynamic stability analysis. Introduction to lateral-directional dynamic stability. Stability derivatives. Application of numerical methods to aircraft design.

130. Aircraft Preliminary Design (4) III. Migliore
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 128, 129; Civil Engineering 135. Aircraft preliminary design including estimation of weight and volume, aerodynamics, performance, stability and control. Design iteration and trade-off studies. (P/NP grading only.)

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.

150A. Mechanical Design and Manufacturing Processes (4) I, III. Hull, Henderson
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Engineering 104B (may be taken concurrently). The principles of engineering mechanics applied to the fundamentals of mechanical design. Theories of static and fatigue failure of metals. Design projects emphasizing reduction of conceptual design to hardware. Manufacturing processes laboratory.

150B. Mechanical Design and Manufacturing Processes (3) I, II. Jones
Lecture—2 hours; discussion—1 hour. Prerequisite: course 150A. Principles of engineering mechanics, failure theories and fatigue theory applied to the design and selection of mechanical components. Design projects which concentrate on conceptual design, engineering analysis, engineering drawing, methods of manufacture, material selection and cost.

151. Statistical Methods in Design (3) II. The Staff
Lecture—3 hours. Prerequisite: course 150A. Methods of statistical analysis with emphasis on applications in mechanical design. Applications include product evaluation and decision making, stress-strength interference, probabilistic design, systems reliability, and fatigue under random loading.

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. The Staff
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, Dwyer
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B and 105B. Effect of friction, heat addition and magnetic body forces on compressible, one-dimensional flows. Application to design of launch vehicle nozzles, engine inlets and combustors, magnetohydrodynamic (MHD) generators and other energy system components.

162. Gas Turbines for Propulsion and Power Generation (4) II. Law
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Study of gas turbine power plants for electric power generation and aircraft propulsion. Gas dynamic and thermodynamic analysis of compressors, turbines, and gas turbine cycles. Design studies of specific engines and powerplants.

165. Fundamentals of Heat Transfer (3) I, II. Baughn, McKillop
Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 5, 103B and 105B. Fundamentals of conduction, convection and radiation heat transfer; applications to engineering equipment with use of digital computers.

166. Thermal System Design (3) III. Hoffman
Lecture—2 hours; discussion—1 hour. Prerequisite: course 165. Application of thermodynamics, fluid flow and heat

NOTE: For key to footnote symbols, see page 123.

transfer principles to design of thermal systems; heat exchanger characteristics and selection; design problem specified by instructor involving solar heating, cooling and power generation, steam power cycles, cogeneration or building heating or cooling.

171. Analysis, Simulation, and Design of Dynamic Systems (4) I, II. Karnopp, Hubbard
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) II. Hess
Lecture—3 hours; discussion—1 hour. Prerequisite: course 171. Phenomenological models for dynamic systems. Control system design using frequency domain methods. Stability of nonlinear control systems. Introduction to state space techniques.

176. Measurement Systems (3) II, III. Beadle, Hull
Lecture—2 hours; discussion—1 hour; laboratory—1 hour. Prerequisite: Engineering 100 and 102A. Theory of measurements; measurement techniques for mechanical systems; transducers; data manipulation and processing; data digitization.

192. Internship in Engineering (1-5) I, II, III. The Staff (Beadle in charge)
Work-learn experience. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work-study experience in mechanical engineering. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Beadle in charge)
Lecture—1-5 hours. Prerequisite: consent of instructor. Group study of selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Beadle in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

205. Thermal Radiation (3) II. Brandt
Lecture—3 hours. Prerequisite: course 165 or consent of instructor. The transfer of radiant energy. Geometrical and spectral characteristics of systems involving thermal radiation. Gaseous radiation. Applications to solar energy systems.

208A. Experimental Methods in Fluid Mechanics and Heat Transfer (2) II. Baughn
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 165 or the equivalent. Uncertainty analysis; steady-state and transient temperature measurement; steady-state flow and pressure measurements.

208B. Measurements of Turbulent Flow Properties (2) III. McKillop
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 208A. Introduction to measurement of turbulent flow properties by use of hot-wire and Laser Doppler anemometry.

210A. Fundamentals of Fluid Mechanics and Heat Transfer (4) I, Dwyer
Lecture—4 hours. Prerequisite: graduate student standing or consent of instructor. Study of the governing equations and their solution. Solution methods for irrotational flow; high and low Reynolds number laminar flow, and heat transport with convection. Analysis Reynolds stresses.

210B. Advanced Fluid Mechanics and Heat Transfer (4) II. Kollmann
Lecture—4 hours. Prerequisite: course 210A. Analytical and numerical analysis of the Navier-Stokes and energy equations for steady, two-dimensional flows. Numerical techniques in solving fluid flow problems; turbulent-transport modeling; boundary layers and flow stability. Other selected topics.

211. Fluid Flow and Heat Transfer Design (4) III. Baughn
Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A or consent of instructor. Design aspects of selected topics from: heat conduction, thermal stresses, fins; heat transport in ducts, boundary layers and separated flows; impingement and film cooling; heat exchangers; flow in diffusers, over airfoils and blades. Other selected topics.

212. Advanced Heat Transfer with Phase Change (4) II. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 165. Study of complex phenomena occurring in two-phase flow, boiling and condensation. Development of fundamental relations. Use of these relations with experimental data to develop semi-empirical working relations; application to various energy system and power-plant problems. Offered in odd-numbered years.

213. Advanced Turbulence Modeling (4) III. Kollmann
Lecture—4 hours. Prerequisite: course 210B. Methods of analyzing turbulence; kinematics and dynamics of homogeneous turbulence; Reynolds stress and heat-flux equations; second order closures and their simplificiation; numerical methods; application to boundary layer-type flows; two-dimensional and three-dimensional hydraulic and environmental flows. Offered in even-numbered years.

214. Advanced Numerical Fluid Mechanics (3) III. Dwyer
Lecture—3 hours. Prerequisite: course 210B. Development and solution of basic and advanced finite difference schemes for the Navier-Stokes equations, laminar and turbulent boundary layer equations, and the potential flow equations. Analysis of the stability and convergence of the methods with practical examples. Offered in odd-numbered years.

215. Gas Dynamics (3) III. 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 (4) I, Law
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 105B. Study of topics important to energy conversion systems, propulsion and other systems using high temperature gases. Classical thermodynamics and quantum statistical mechanics of nonreacting and chemically reacting gases, gas mixtures, and other substances.

217. Analysis of Reacting Flows (3) I, White
Lecture—3 hours. Prerequisite: course 210A and 216. Derivation and analysis of basic equations for chemically reacting flow systems. Calculation of high temperature gas properties and use of reaction rate models. Selected applications to both laminar and turbulent flame propagation in both steady and unsteady situations. Offered in odd-numbered years.

218. Advanced Energy Systems (4) III. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B, or the equivalent. Review of options available for advanced power generation. Detailed study of basic power balances, component efficiencies, and overall powerplant performance for one advanced concept such as a fusion, magnetohydrodynamic, or solar electric powerplant.

220A-220B. Mechanical Vibrations (3-3) II, III. Karnopp
Lecture—3 hours. Prerequisite: Engineering 122. Applications of vibration theory to systems with many degrees of freedom and continuous systems. Introduction to random vibrations.

222. Advanced Dynamics (3) I, Jones
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 Bermester 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 (3) I, Margolis
Lecture—3 hours. Prerequisite: Engineering 122. Description of sound using normal modes and waves; interaction between vibrating solids and sound fields; sound absorption in enclosed spaces; sound transmission through barriers; applications in design of mufflers, acoustic enclosures, room acoustics, design of quiet machinery.

250. Engineering Case Studies (2) II. The Staff
Discussion—2 hours. Studies of selected problems which illustrate various methods of the design process and management in advanced mechanical engineering systems.

255. Computer-Aided Mechanical Design (3) III. Jones
Lecture—2 hours; discussion—1 hour. Prerequisite: course 150B. 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, Kamopp
Lecture—3 hours. Prerequisite: course 172 or consent of instructor. Multiport models of mechanical, electrical, hydraulic and thermal devices; bond graphs, block diagrams and state space equations; Hamilton's principle for complex systems; formulation for analog and digital simulation; identification; instrumentation, approximate models of distributed systems.

271. Design of Multivariable Control Systems (3) II. Kamopp
Lecture—3 hours. Prerequisite: course 270 or consent of instructor. Modern methods of state variable feedback applied to control system design. Introduction to observers and equivalent dynamic feedback. Stress on practical application of theory to engineering systems in various energy domains.

272A. Mathematical Foundations of System and Control Theory (4) I, Brewer
Lecture—4 hours. Prerequisite: course 172 or the equivalent. Singularity functions, Laplace transforms, and Z-transforms. Algebra of polynomials and matrices. Reducibility, controllability, and observability. Observers and feedback control for single-input and single-output systems. Equal emphasis on digital and continuous control. Frequency domain and state variable methods.

272B. Multivariable Feedback Control and Estimation Theory (4) II. Brewer
Lecture—3 hours; computational laboratory—3 hours. Prerequisite: courses 270, 272A. Emphasis on multiinput, multioutput systems. Digital and continuous time control and estimation. Introduction to geometric methods; optimum quadratic control; Kalman filters; frequency domain methods; multivariable poles, zeros.

273. Computer-Aided Design of Estimation and Control Systems (4) III. Hubbard
Lecture—3 hours; computational laboratory—3 hours. Prerequisite: course 272B. Use of computers in design of multivariable control and estimation systems. Algorithms and graphical methods; optimal control; multivariable Nyquist arrays. Introduction to singular value analysis and the design of robust control systems.

274. Analysis and Design of Digital Control Systems (4) III. Hess
Lecture—3 hours; discussion—1 hour. Prerequisite: course 172 or consent of instructor. Discrete systems analysis, digital filtering, sample data systems, state space and transform design techniques, quantization effects, specific applications to aircraft.

275. Advanced Topics in Aircraft Stability (4) III. Hess
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 129 or 134, and 172. Analysis of aircraft modes of motion; response to control actuation; time and frequency domain descriptions; response to random inputs—turbulence description; autopilot and stability augmentation system design; pilot/vehicle analysis; handling qualities. Offered in even-numbered years.

276. Data Acquisition and Analysis (3) II. Hull
Lecture—2 hours; discussion—1 hour. Prerequisite: course 176. Principles of data acquisition with emphasis on digital techniques. Use of micro and minicomputers to control data acquisition process. Methods of data analysis including probability distributions, correlations, regression, and Fourier analysis. Special attention to digital spectral analysis.

277. Computer-Aided Design of Nonlinear Dynamic Systems (3) III. Margolis
Lecture—2 hours; discussion—1 hour. Prerequisite: courses 270, 271. Application of bond graph modeling and control system design principles. The bond graph processor progams ENPORT and CAMP are used with advanced continuous system modeling programs to simulate the dynamic response of engineering systems.

280. Advanced Engineering Analysis (3) I, Brandt
Lecture—3 hours. Prerequisite: Engineering 180 or the equivalent. Applications in mechanical engineering or advanced analytical and numerical techniques. Topics include probablility theory, calculus of variations, classification of differential equations, and advanced numerical methods.

290. Seminar (1) II. The Staff (Beadle in charge)
Seminar—1 hour. (S/U grading only.)

295. Design Seminar (1) I, III. Beadle
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion or current mechanical engineering design literature and projects with presentations by students and faculty. (S/U grading only.)

296. Fluid and Thermal Sciences Seminar (1) I, III. Dwyer
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of the current literature and trends in fluid mechanics and thermal sciences. (S/U grading only.)

297. Dynamic Systems and Control Theory Seminar (1) I, III. Margolis, Hubbard
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in system theory and automatic control with presentations by individual students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Beadle in charge)

299. Research (1-12) I, II, III. The Staff (Beadle in charge) (S/U grading only.)

Courses in Materials Science and Engineering

Undergraduate courses in Materials Science and Engineering are listed beginning on page 186 under Engineering core courses as Engineering 130 through 147, inclusively.

NOTE: For key to footnote symbols, see page 123.

Graduate Courses

240. Transport Phenomena in Materials Processes (4) III. Shackelford
Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Engineering. Phenomenological and atomistic mechanisms in transport processes in condensed and non-condensed phases. Application to heat treatment, chemical and physical vapor deposition, crystal growth, bonding, sintering and joining of metals. Offered in even-numbered years.

241. Principles and Applications of Dislocation Mechanics (3) III. Mukherjee
Lecture—3 hours. Prerequisite: graduate standing in Engineering; consent of instructor. Concepts in dislocation theory are applied to explain plasticity of crystalline solids. Glide and climb of dislocations, strain hardening, recrystallization, theories of creep processes and interaction of dislocation with solute atoms, precipitates and impurity clouds are discussed. Offered in even-numbered years.

242. Advanced Mechanical Properties of Materials (3) III. Mukherjee
Lecture—3 hours. Prerequisite: Engineering 138 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 Transformation in Engineering Materials (3) II. The Staff
Lecture—3 hours. Prerequisite: graduate standing in Engineering and consent of instructor; Engineering 130 recommended. Theory of alloying, kinetics of phase changes, homogeneous and heterogeneous transformation, transformation by shear, order-disorder reactions. Offered in even-numbered years.

244. Interaction of Materials and their Environment (3) I, Munir
Lecture—3 hours. Prerequisite: Engineering 45 and 105A, or consent of instructor. Thermodynamic and kinetic foundations of the corrosion and oxidation processes. Practical aspects of corrosion control and prevention. Stress-corrosion and gas-embrittlement phenomena. Special topics in corrosion; microbiological and atmospheric corrosion. Offered in even-numbered years.

245. Advanced Topics in Structure of Materials (4) III. Shackelford
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 132 and graduate standing in Engineering or consent of instructor; Engineering 142 and 138 recommended. Nature of microstructure in engineering materials will be explored. Crystalline and non-crystalline structures will be studied with special emphasis on grain boundary segregation in development of polycrystalline microstructure and the radial distribution function of amorphous materials. Offered in odd-numbered years.

***246A. Fundamentals of Transmission Electron Microscopy** (3) II. Howitt
Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor; course 246L (concurrently). Principles and techniques of transmission electron microscopy used in study of materials will be described. Emphasis upon practical applications and a required laboratory section. Offered in odd-numbered years.

***246L. Laboratory for Electron Microscopy** (2) II. Howitt
Laboratory—6 hours. Prerequisite: course 246A (may be taken concurrently); consent of instructor. Practical application of techniques of electron microscopy. Preparation and observation of crystalline specimens, photographic recording techniques, and instrument alignment. Offered in odd-numbered years.

***247. Advanced Thermodynamics of Solids** (3) I, Munir
Lecture—3 hours. Prerequisite: Engineering 130 or the equivalent. Thermodynamics of gas-solid reactions and solutions; criteria for phase stability, thermodynamics of surfaces and interfaces; thermodynamics of defects in compounds, their influence on transport processes; thermodynamics of EMF cells and application to solid-state electrolytes. Offered in odd-numbered years.

294. Materials Science Seminar (1) I, II, III. Shackelford, Mukherjee, Munir, Howitt
Seminar—1 hour. Prerequisite: graduate student in good standing. Review and discussion of current literature and developments in materials science with presentations by individual students.

299. Research (1-12) I, II, III. The Staff (Beadle in charge) (S/U grading only.)

English

(College of Letters and Science)

Michael J. Hoffman, Ph.D., Chairperson of the Department

Department Office, 114 Sproul Hall

Faculty

William E. Baker, Ph.D., Professor
[4]Max Byrd, Ph.D., Professor
Everett Carter, Ph.D., Professor
Peter A. Dale, Ph.D., Associate Professor
[1]Joanne Feit Diehl, Ph.D., Associate Professor
[2]Elliot L. Gilbert, Ph.D., Professor
[2,3]Sandra M. Gilbert, Ph.D., Professor
[2]Thomas A. Hanzo, Ph.D., Professor
Wayne Harsh, Ph.D., Professor
(English, Linguistics)
[1]John O. Hayden, Ph.D., Professor
Peter L. Hays, Ph.D., Professor
W. Jack Hicks, Ph.D., Associate Professor
[4]Michael J. Hoffman, Ph.D., Professor
Robert H. Hopkins, Ph.D., Professor
Michael P. Kramer, Ph.D., Assistant Professor
Richard A. Levin, Ph.D., Associate Professor
Arthur E. McGuinness, Ph.D., Professor
Linda A. Morris, Ph.D., Lecturer
James J. Murphy, Ph.D., Professor
Diane Johnson Murray, Ph.D., Professor
Gwendolyn B. Needham, Ph.D., Professor Emeritus
[2]Marijane Osborn, Ph.D., Associate Professor
David A. Robertson, Ph.D., Associate Professor
Winfried Schleiner, Ph.D., Associate Professor
[2]Gwendolyn Schwabe, M.A., Lecturer
Karl J. Shapiro, Professor Emeritus
Daniel Silvia, Ph.D., Associate Professor
Raymond B. Waddington, Professor
Brom Weber, Ph.D., Professor of American Literature
Robert A. Wiggins, Ph.D., Professor
Alan B. Williamson, Ph.D., Professor
James L. Woodress, Ph.D., Professor
Celeste T. Wright, Ph.D., Professor Emeritus
Karl F. Zender, Ph.D., Associate Professor

The Major Program

The study of English develops skills in reading analytically and perceptively and in writing clearly and with effect; thus it is a preparation for careers in writing, teaching, and editing, or for any role in which clear communication is important. The program offers its majors several options. A student majoring in English may elect the general study of English and/or American literature or may choose to emphasize (1) Linguistics, (2) Teaching, or (3) Writing.

Faculty-student interaction is encouraged by participation in the English Club, which meets once a quarter, often in a faculty home. Qualified creative writing students may gain valuable experience for academic credit by helping to edit the Department's nationally known *California Quarterly*.

English

A.B. Degree Requirements:

	UNITS
Preparatory Subject Matter	**24**
One course from English 1, 2, 3	4
English 45	4
English 30A, 30B, 46A, 46B	16
Depth Subject Matter (for each emphasis, see below)	**40**
Core requirement	20
One course from each of the following five groups	
(a) British Literature to 1500: English 111, 112, 113A, 113B, 150A.	
(b) Renaissance (1500-1660): English 116, 117A, 117B, 117C, 120, 122, 150B.	
(c) British Literature (1660-1800): English 125, 127, 155A. American Literature (1620-1800): English 140, 141.	
(d) Nineteenth Century (British or American): English 130, 132, 133, 134, 143, 144, 155B, 155C, 158A.	
(e) Twentieth Century (British or American): English 136, 137, 138, 139, 146, 147, 150D, 152, 155D, 158B, 179, 181, 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, 125, 127, 130, 132, 133, 134, 136, 137, 138, 139, 140, 141, 143, 144, 146, 147.

(b) Poetry:
English 113A, 113B, 122, 160.

(c) Drama:
English 117A, 117B, 117C, 150A, 150B, 150D, 152, 183.

(d) Fiction:
English 155A, 155B, 155C, 155D, 156, 158A, 158B.

The following courses—English 107, 110A, 110B, 171A, 171B, 173, 174, 175, 179, 180, 181, 183, 185, 187, 188, 189, 198, and 199—are designed for studying a special subject, one that may be fairly constant in format (as with English 110A, 110B, 171A, 171B, 173, 174, 175, 179, 180, 181, 183, 185) or one that may vary each time the course is offered (as with English 107, 187, 188, 189, 198, 199). These special subject courses may satisfy core requirements and/or emphasis core requirements; in order to ascertain the applicability of one of these courses to the major, you should consult with an adviser.

General Major

Depth Subject Matter	**40**
Core requirements (see above)	20
One course from language) linguistics group: English 105A, 105B, 105C, 105D, 107, 196	4
A seminar in student's area of emphasis selected from English 187, 188, 189, 196, or 198	4
Twelve elective units in upper division English courses	12
Total Units for the Major	**64**

Linguistics Emphasis

Depth Subject Matter	**40**
Core requirement, same as for (General) major above	20
Four courses in Linguistics	16
One elective course	4
Total Units (Linguistics Emphasis)	**64**

Teaching Emphasis

Depth Subject Matter	**40**
Core requirement, same as for (General) major above, but must include one course from English 117A, 117B, or 117C	20
Seminar in British or American literature: English 187, 188, or 189	4
English 103A-G, 105A, 105B	12
One of the following: English 179, 181, or an ethnic literature course from outside the English department	4
Total Units (Teaching Emphasis)	**64**

Writing Emphasis

Depth Subject Matter	**40**
Core requirement, same as for (General) major above	20
One course from the language/linguistics group: English 105A, 105B, 105C, 105D, 107, 196	4
Twelve units in English 100F, 100P and/or 100NF	12
English 198 (seminar in writing techniques) or 199 (writing)	4
Total Units (Writing Emphasis)	**64**

English Majors
Up to four upper-division units in a national literature other than English or American, or in Comparative Literature, may count toward the requirements of the major.

NOTE: For key to footnote symbols, see page 123.

Minor Program Requirements:

	UNITS
English	**20**
Five upper-division courses, four of which will be literature courses	20

Campus Writing Center

The Campus Writing Center, an affiliate of the English Department, is a program designed to provide writing instruction across the curriculum. Of special interest to students are its adjunct writing courses, which are offered to students who are simultaneously enrolled in specified courses in other disciplines. Topics of instruction and writing assignments in each adjunct course all relate to the subject matter of the companion course. These are credit-bearing courses offered in conjunction with both lower and upper division courses in agriculture, engineering, and letters and sciences. Interested students and faculty should contact the Campus Writing Center, telephone 752-8024, for the current schedule of courses.

Subject A. Students must have passed the Subject A requirement before taking any course in English.

Prerequisites. One course from 1, 2, 3 is required for admission into courses 30A, 30B, 30C, 45, 46A, 46B, 46C, and all upper division courses. Course 45 is recommended as preparation for the 30 and 46 series.

Meeting for Majors. All English majors are re quired to attend a general meeting for majors at the beginning of each year; all new and transfer English majors are required to attend a general meeting for majors at the beginning of their first quarter in residence; all English majors must see their advisers, individually, in the spring quarters of their sophomore and junior years.

Major Advisers. W. E. Baker, M. Byrd, E. Carter, P. A. Dale, E. L. Gilbert, S. M. Gilbert, W. Harsh, J. O. Hayden, P. L. Hays, W. J. Hicks, R. H. Hopkins, M. P. Kramer, R. A. Levin, A. E. McGuinness, D. J. Murray, M. Osborn, D. A. Robertson, W. Schleiner, D. Silvia, R. B. Waddington, B. Weber, R. A. Wiggins, A. B. Williamson, J. L. Woodress.

Foreign Languages. Students who contemplate advanced study in English should prepare for foreign language require ments for higher degrees, and should consult with the graduate adviser.

Honors and Honors Program. See page 63 and 92.

Teaching Credential Subject Representatives. W. Harsh, W. Schleiner. See also page 98 for more details on the Teacher Education Program.

Graduate Study. The Department of English offers programs of study and research leading to the M.A. and Ph.D. degrees. Detailed information may be obtained from the graduate adviser or the Chairperson of the Department.

Graduate Adviser. R. B. Waddington.

Courses in English

Lower Division Courses

A. Language Skills (0) I, II, III. The Staff (Morris in charge)
Lecture-discussion—4 hours. Introductory course to help students gain writing proficiency required for successful University-level work. Course will focus on the nature and mechanics of written English and the relationship between writing mechanics and coherent thought. This course must be taken for a letter grade. Minimum passing grade is a C; students receiving a C− or below must repeat course. Satisfies Subject A requirement. (Counts as 4 units toward minimum progress.)

R. Communications Skills Workshop (no credit) I, II, III. The Staff (Morris in charge)
Lecture—4 hours; workshop—2 hours; reading laboratory—1 hour. Workshop in language skills for students from non-standard-English backgrounds who need to strengthen basic skills before taking English A. Course worth 6 units toward minimum study list requirement. (P/NP grading only.)

1. Expository Writing (4) I, II, III. The Staff (Morris 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 (Morris 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 (Morris in charge)
Lecture—2 hours; Discussion—2 hours. Prerequisite: completion of Subject A requirement. Introductory study of several genres of English literature, emphasizing both analysis of particular works and the range of forms and styles in English prose and poetry. Frequent writing assignments will be made.

5F. Introduction to Creative Writing: Fiction (4) I, II, III. The Staff (Morris in charge)
Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing fiction. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

5P. Introduction to Creative Writing: Poetry (4) I, II, III. The Staff (Morris in charge)
Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. The elementary principles of writing poetry. Students will write both in prescribed forms and in experimental forms of their own choosing. No final examination.

20. Intermediate Composition (4) I, II, III. The Staff (Morris in charge)
Lecture-discussion—4 hours. Prerequisite: one course from 1, 2, or 3. Emphasis on the grammatical patterns of standard English, sentence revision techniques, development of coherent paragraphs, and the formal properties of the expository essay.

25. English for Foreign Students (5) I, II, III. 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 (2) I, II, III. Library staff (Chairperson in charge)
Lecture—1 hour, practicum—3 hours. Methodology of research in libraries: catalogs, indexes and abstracts, bibliographies, computers, reference books, specialized sources. Emphasis on preparation of detailed bibliographies for term papers, reports; offered in conjunction with campus libraries. (P/NP grading only.)

30A. Survey of American Literature (4) I, Wiggins
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. American literature from the seventeenth century to 1830.

30B. Survey of American Literature (4) II, Wiggins; III. Morris
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. American literature from 1830 to 1900.

30C. Survey of American Literature (4) I, Hays; III, Hicks
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. American literature of the twentieth century.

45. Critical Reading of Poetry (4) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. Close reading of selections from English and American poetry. Frequent written exercises.

46A. Masterpieces of English Literature (4) I, Schleiner; II, Osborn
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. Selected works of principal writers to 1640. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

46B. Masterpieces of English Literature (4) II, McGuinness; III, ———
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. Selected works of principal writers from 1640 to 1800. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

46C. Masterpieces of English Literature (4) III. E. Gilbert (Chairperson in charge)
Lecture-discussion—4 hours. Prerequisite: one course from courses 1, 2, 3. Selected works of principal writers from 1800 to present. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms.

92. Internship in English (1-12) I, II, III. The Staff (Chairperson in charge)
Fieldwork—3-36 hours. Prerequisite: one course from English 1, 2, 3. Internships in fields where students can practice their skills. May be repeated for credit for a total of 12 units. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: one course from courses 1, 2, 3. Directed group study of a special topic. Primarily for lower-division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100F. Creative Writing: Fiction (4) I, II, III. The Staff (Chairperson in charge)
Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 5F or 5P, or consent of instructor; priority given to English (Creative Writing) majors. Writing of fiction. May be repeated for credit with consent of instructor. No final examination.

100NF. Creative Writing: Non-Fiction (4) I, Hicks
Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: one course from courses 1, 2, 3, or consent of instructor; priority given to English (Creative Writing) majors. Writing of non-fiction. May be repeated for credit with consent of instructor. No final examination.

100P. Creative Writing: Poetry (4) I, II, III. The Staff (Chairperson in charge)
Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 5F or 5P, or consent of instructor; priority given to English (Creative Writing) majors. Writing of poetry. May be repeated for credit with consent of instructor. No final examination.

102. Adjunct Writing (3) I, II, III. The Staff (Morris in charge)
Discussion—3 hours. Prerequisite: completion of Subject A requirement and of one course from English 1, 2, 3; concurrent enrollment in a specified course in a subject-matter discipline. Instruction in the elements of expository writing, with special emphasis on their application to writing projects in a specified academic discipline. May be repeated once for credit if taken in conjunction with a different subject-matter course. (P/NP grading only.)

103A-G. Advanced Composition (4) I, II, III. The Staff (Morris in charge)
Lecture-discussion—3 hours; individual evaluations and conferences—1 hour. Prerequisite: one course from courses 1, 2, 3; course 20 recommended. Instruction and practice in a variety of modes of composition. Frequent written assignments. One area required of teaching credential candidates (section "F" strongly recommended). Study areas are: **(A)** General; **(B)** Legal Writing; **(C)** Article Writing; **(D)** Report Writing; **(E)** Technical Writing; **(F)** Composition for Elementary and Secondary Teachers; **(G)** Pre-Professional Writing. May be repeated once for credit in different area of emphasis.

104. Scientific Writing (1-3) I, II, III. The Staff (Morris in charge)
Lecture—2 hours; discussion—1 hour. Prerequisite: upper division enrollment in a science curriculum. Analysis and practice of scientific writing; research methods, organization, proper style and format, oral presentation of scientific papers. Lecture and workshop-discussions by English-science department staff. May be repeated for a total of 4 units of credit. (P/NP grading only.)

105A. Language (4) I, Harsh
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Present-day English grammar and pronunciation according to the perspectives of traditional grammar and contemporary linguistics.Preparation for stylistic analysis and historical study of English language and literature. Required of teaching credential candidates.

105B. Language (4) II. Harsh
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. History of the English language. Examination of the language as recorded from Old English to present-day English. Relationship of English to other languages; development of vocabulary, phonology, and grammatical patterns. Required of teaching credential candidates.

105C. Language Change Reflected in Literature (4) III. Schleiner

NOTE: For key to footnote symbols, see page 123.

Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Study of literary texts from the various historical periods in the English language, considering, in addition to other stylistic features, those characteristics particularly connected with development and change in the respective linguistics periods.

***105D. Linguistics, Literature, and Composition** (4) II. Harsh
Lecture-discussion—3 hours; term paper. Prerequisite: courses 105A and 105B. Linguistic theories and methods in literary analysis and in composition. Course considers structural linguistics and transformational grammar exemplified in analysis, criticism, and content of belletristic and nonbelletristic written materials.

***107. Special Topics in English Language** (4) II. Schleiner
Seminar—3 hours; special project. Prerequisite: one course from courses 1, 2, 3. Investigation of varied subjects in contemporary and historical English language studies. May be repeated for credit when a different topic is studied. (Same course as Linguistics 107.)

***110A. Introduction to Principles of Criticism** (4) I, Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The essentials of literary criticism and its history from Aristotle to the modern era, with emphasis on the major critics.

***110B. Introduction to Principles of Criticism** (4) I, Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The history of literary criticism in the modern era, with emphasis on the ties with the past and the special problems presented by modern literary theory.

***111. Medieval Literature** (4) III. Murphy
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Major types, traditions, and conventions of literature in England from the time of *Beowulf* to the late medieval romances, with special emphasis on the heroic strain, courtly love and its impact, and the development of Arthurian literature. Mostly in translation.

***112. The Age of Chaucer** (4)
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The literary, religious, and social movements of the later fourteenth century in England as they are reflected in the writings of Chaucer, Langland, the *Gawain* poet, and their contemporaries; the fifteenth-century Chaucerians.

113A. Chaucer: *Troilus* and the *Minor* Poems (4) III. Osborn
Lecture—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The development of the poet's artistry and the evolution of the poet's ideas from his first work to his culminating masterpiece, *Troilus and Criseyde*. Courses 113A and 113B need not be taken in sequence.

113B. Chaucer: *The Canterbury Tales* (4) II. Silvia
Lecture—3 hours; term paper. Prerequisite: one course from 1, 2, 3. *The Canterbury Tales* complete as a work of art. Courtly love, literary forms, medieval science and astrology, theology and dogma as they inform the reading of Chaucer. Courses 113A and 113B need not be taken in sequence.

116. Sixteenth-Century Poetry and Prose (4) III. Harsh
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Poetry of Skelton, Wyatt, Surrey, Sidney, Spenser, Marlowe, and Shakespeare; selected discursive prose and fiction. Political, religious, and intellectual background.

117A. Shakespeare: The Early Works (4) I, Levin; II, Silvia
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Selected major works from Shakespeare's early period, up to 1599. Courses 117A-117B-117C need not be taken in sequence.

117B. Shakespeare: The Middle Period (4) II, Levin; III, Schleiner, Zender
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Selected major works from Shakespeare's middle period, up to 1604. Courses 117A-117B-117C need not be taken in sequence.

117C. Shakespeare: The Later Works (4) II, Zender; III, Levin
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Selected major works from Shakespeare's later period. Courses 117A-117B-117C need not be taken in sequence.

118. Shakespeare (4) I, Silvia
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Selected major works by Shakespeare. Recommended for non-majors. May not be applied toward the English major.

120. Earlier Seventeenth-Century Poetry and Prose (4) II. Waddington
Lecture-discussion—3 hours; term paper or the equivalent. Prerequisite: one course from courses 1, 2, 3. Major authors, forms, and styles. Donne, Jonson, Marvell, Bacon, Browne, Hobbes. Tradition and revolution.

122. Milton (4) I, Schleiner
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Selected major works, including *Paradise Lost*.

125. The Age of Swift and Pope: Prose and Poetry (4) II. Hopkins
Lecture-discussion—3 hours; term paper or the equivalent. Prerequisite: one course from courses 1, 2, 3. 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, Byrd
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Readings in Johnson, Goldsmith, Boswell, and others; the poetry of the era concluding with Blake.

***130. Early Romantic Literature** (4) III. Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Blake, Burns, Wordsworth, Coleridge, Scott; the eighteenth century background and the development of Romantic concepts of imagination.

***132. Later Romantic Literature** (4) I, Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Byron, Shelley, Keats. Individualism and revolt.

***133. Early Victorian Literature** (4) I, E. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Tennyson, Browning, Arnold, and selected prose writers. The Victorian temper; the individual and society, the search for faith. The impact of scientific thought upon creative thinkers.

134. Later Victorian Literature (4) II, E. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Ruskin, Hardy, Hopkins, and others. The Oxford movement, the Pre-Raphaelites; art and sociology; aestheticism and decadence; pessimism. Tendencies continuing into the Edwardian period.

***136. British Literature from 1880 to 1918** (4) II. Williamson
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Yeats, Conrad, Joyce. Aestheticism, naturalism, symbolism, and impressionism. The transition from Victorian to twentieth-century styles and attitudes.

***137. British Literature from 1918 to 1940** (4) II.
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Lawrence, Eliot, Forster, and others. Post-war attitudes. Modern psychology and the awareness of myth.

***138. British Literature from 1940 to the Present** (4) Hanzo
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Literature of England and Ireland from World War II to the present. Major themes in the novel, poetry, and short story.

139. Modern Anglo-Irish Writers (4) I, McGuinness
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. A study of Yeats, Joyce, George Moore, John Synge, James Stephens and others.

140. Origins of American Literature (4) I, Kramer
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Seventeenth-century American literature; special attention to European literary-intellectual traditions, dominant American forms (poems, sermon, history), and major writers (Ann Bradstreet, Edward Taylor and others).

141. The American Enlightenment and Its Reaction (4) III. Kramer
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Eighteenth-century American literature; rise of neoclassicism, liberal religion, popular literature, scientific thought, satiric tempers; decline of Puritan traditions; major writers, including Franklin, Edwards, Freneau, and Brackenridge.

143. Aspects of American Romanticism (4) I, Carter
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Flowering of American romanticism; the metaphysical tradition, Oriental and European antecedents, philosophical idealism, and literary achievement of Transcendentalism (Emerson, Thoreau, Whitman); the critical tempers of Hawthorne and Melville; Emily Dickinson.

144. American Literature from 1865 to 1914 (4) II. Carter
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Religion, local color, social criticism, naturalism, *fin de siècle* aestheticism; Twain, James, Crane, Dreiser, Howells.

146. Modern American Literature: 1914-1940 (4) II. Hays
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The Modernist movement, disillusionment, artistic experimentalism, classical revival, New Criticism, proletarian literature, romantic nationalism, European currents; Pound, Fitzgerald, Eliot, Frost, Hemingway, Crane, Faulkner and Stevens.

147. Modern American Literature: 1940 to the Present (4) III. Hicks
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Contemporary fiction, poetry, and drama. The impact of World War II on the younger writers; experimentation and formalism in poetry and the drama.

***150A. English Drama to Marlowe** (4)
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Development of the drama from its beginnings to the Renaissance. Miracle and mystery plays; the morality tradition. Early comedy, tragedy, and chronicle plays.

***150B. English Drama from Marlowe to 1642** (4)
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Shakespeare's contemporaries in the drama, including Webster, Jonson, Beaumont and Fletcher, and others. The revenge play and tragicomedy; post-Shakespearean development of dramatic action and blank verse.

150D. British Drama from 1890 to the Present (4) I, McGuinness
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The rise of dramatic realism; the chief reactions against it. Emphasis on Shaw, O'Casey, Osborne.

***152. American Drama from Its Beginnings to the Present** (4) III. Hays
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Critical and historical survey of drama in America from its eighteenth-century origins with emphasis on O'Neill, Williams, Miller, and others.

155A. The English Novel: 1700-1770 (4) I, Hopkins
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Realism and the rise of the modern novel. Defoe, Richardson, Fielding, Sterne, and Smollett.

155B. The English Novel: 1770-1850 (4) II. Hopkins
Lecture—3 hours; extensive writing (includes 5 two-page position papers). Prerequisite: one course from courses 1, 2, 3. Evolution of the novel from 1770-1850 with particular emphasis on the invention of the Gothic novel (Radcliffe, Mary Shelley), invention of the historical novel (Sir Walter Scott), and contribution of women writers to fiction (Jane Austen, Emily, Charlotte and Anne Bronte).

155C. The English Novel: 1850-1900 (4) III. Dale
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Major Victorian novelists: their theory and practice. Dickens, Thackeray, Trollope, Eliot, Meredith, and Hardy.

155D. The English Novel: 1900 to the Present (4) II. Hanzo
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Major figures including Conrad, Joyce, and Lawrence. Impressionism, the revolt against naturalism; the experimental novel; the anti-modernist reaction.

156. The Short Story (4) II. Weber
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The short story as a genre; its historical development, techniques, and formal character as a literary form. European as well as American writers.

158A. The American Novel to 1900 (4) II. Woodress
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Rise and development of the American novel from its beginnings. Hawthorne, Melville, Twain, and others.

158B. The American Novel from 1900 to the Present (4) III. Hays
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Major American novelists of the twentieth century. Faulkner, Hemingway, Fitzgerald, and others.

***160. The English Lyric** (4)
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. The history of poetic style from the sixteenth to the twentieth centuries. Major examples of the short poem in relation to intellectual history, to foreign influences, and to the development of poetic forms.

171A. The Bible as Literature: The Old Testament (4) I, Robertson
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. May be taken independently of course 171B. Selected readings from the Old Testament illustrating various literary forms. Emphasis on the Pentateuch, the Historical Books, and the Wisdom Books. Offered in even-numbered years.

NOTE: For key to footnote symbols, see page 123.

171B. The Bible as Literature: Prophets and New Testament (4) II. Robertson
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. May be taken independently of course 171A. Selected readings from the Old Testament prophets and the New Testament. Offered in odd-numbered years.

***173. The Literature of Science Fiction** (4) III. Hanzo
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. Study of the literary modes and methods of science fiction. The course will analyze representative novels and short stories which exemplify major themes and styles in this genre—e.g., time travel; alternative universes; utopian, anthropological, sociological science fiction.

***174. Agricultural Experience through American Literature** (4) II. Weber
Lecture-discussion—3 hours; paper. Prerequisite: one course from 1, 2, and 3, or standing above Freshman level. Agricultural experience through American fiction, poetry, and other literary forms from colonial times to the present. Reading of important authors such as Steinbeck, Frost, Cather, Garland, Crèvecoeur, Rolvaag, Hawthorne, Glasgow, and Faulkner.

***175. American Literary Humor** (4) III. Weber
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, and 3, or standing above Freshman level. American humorous vision of man, nature, and the supernatural. Includes one or more of the following: colonial humor; southwestern and New England humor; pre- and post-Civil War masters; local colorists; journalistic gadflies; anti-provincialists; modernist poets and prose writers; black humor.

179. Multi-Ethnic Literature (4) II. Weber
Lecture-discussion—3 hours; papers. Prerequisite: one course from courses 1, 2, and 3, or standing above Freshman level. Fiction, poetry, and other writings by Americans of ethnic minority background (Native, Black, Hispanic, Jewish, Italian, etc.) which reveal their immigrant experience, cultural diversity, and contributions to American literature.

180. Children's Literature (4) III. Wiggins
Lecture-discussion—3 hours; paper. Prerequisite: one course from courses 1, 2, 3. Historical backgrounds and development of types of children's literature, folklore and oral tradition, levels of interest, criticism and evaluation, illustration and bibliography.

***181. Black Literature** (4) Hicks
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. A study of the writings of black Americans, including Chestnutt 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.

183. Film as Narrative (4) I, III. Silvia
Lecture—2 hours; discussion—1 hour; film viewing—1½–2 hours. Prerequisite: one course from courses 1, 2, 3; Dramatic Art 15 or consent of instructor. A close study of modern cinema (1930-60) as a storytelling medium. Emphasis on the work of American and British artists (Ford, Huston, Hitchcock, Welles).

185. Literature by Women (4) III.
Lecture-discussion—3 hours; term paper. Prerequisite: one course from courses 1, 2, 3. English language literature by women from Bradstreet and Behn to the Brontes, Eliot, Woolf, Plath, and Rich. The effects of social constraints upon women's art; the rise of feminism; new trends in literary criticism.

187. Literature and Other Arts (4) III. Robertson
Seminar—3 hours; term paper. Prerequisite: junior or senior standing with a major in English or consent of instructor. Group study of the relationship between the forms of literature and the forms of the other arts, with detailed study of one of the crucial periods of artistic development in western culture.

188. Special Topics in Literary Studies (4) 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. May be repeated for credit with consent of instructor.

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. May be repeated for credit with consent of instructor.

192. Internship in English (1-12) I, II, III. The Staff (Chairperson in charge)
Field work—3-36 hours. Prerequisite: one course from 1, 2, 3. Internships in fields where students can practice their skills. A maximum of 4 units is allowed toward the major in English. May be repeated for credit for a total of 12 units. (P/NP grading only.)

***196. Stylistics** (4) II. 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.)

197T. Tutoring in English (1-4) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper division standing and consent of Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. Does not fulfill requirement for major. May be repeated for credit for a total of 8 units. (P/NP grading only.)

197TC. Community Tutoring in English (1-4) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper-division standing and a major in English; consent of Chairperson. Field experience, with individuals or in classroom in instruction of English language, literature, and composition. Does not fulfill requirement for major. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: one course from courses 1, 2, 3, 5F, 5P. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Techniques of Literary Scholarship (4) I, Waddington
Discussion—3 hours. The elements of bibliography with special attention to literature and discussion of the principal modes of literary investigation—critical, historical, textual, and others.

***201. Literary Criticism** (4) II. Hayden
Discussion—3 hours. Survey of the major critics from Aristotle to the present, with emphasis on the relationship of critical theory to the history of literature.

***203. Theory and Practice of Written Composition** (4) III. Harsh
Seminar—3 hours; practical exercise of writing and tutorial assignments. Students admitted into this course by examination of their own writing skills. (Those with insufficient advanced command of writing shall be required to take a special section of course 103, at no credit, before enrolling in course 203.) Instruction in the teaching of composition. Emphasis on mastering both the basics and finer points of expository prose and on teaching such skills to others.

205. Introduction to Old English (4) II. Osborn
Discussion—3 hours; written reports; individual conferences. The language of Anglo-Saxon England; readings in Old English prose and poetry.

206. Beowulf (4) III. Osborn
Discussion—3 hours; oral and written report; conferences with students. Prerequisite: course 205 or the equivalent. A study of the poem and the Heroic Age of Germanic literature. Offered in odd-numbered years.

***207. Middle English** (4) I, Osborn
Discussion—3 hours; term paper. Study of the phonology, morphology, syntax, and lexicon between 1100 and 1500 with investigation of the regional dialects; pertinent facts on both the internal and external linguistic history; intensive reading of texts.

***209. Present-Day English Linguistics** (4) II. Harsh
Discussion—3 hours; term paper. Theory and methods of structural linguistics and transformational grammar as applied to the analysis of English. Emphasis will be on recent linguistic techniques, particularly as these relate to the teaching of language, literature, and composition.

***210. Readings in English and American Literature** (4) I, Hays
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. Osborn
Discussion—3 hours. The sources of Arthurian Romantic literature. Continental and English literary treatment; Malory's synthesis; significant changes of attitudes in post-Malory literature.

***225. Topics in Irish Literature** (4) II. McGuinness
Seminar—3 hours. Prerequisite: course 139. Course will vary from quarter to quarter and will include such topics as the nineteenth-century novel, contemporary Irish poetry, rise of the drama, or a study of a major author.

230. Study of a Major Writer (4) I, Dale, Zender; II, S. Gilbert; III, Waddington
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) III. Williamson
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, Diehl, Hicks; III, Hays, Cohn, (Comparative Literature), Zender
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. Cohn *(Dramatic Art)*
Seminar—3 hours. Historical introduction to dramatic theory; the genres of tragedy, comedy, and tragicomedy.

235A. Theory of Fiction (4) III. Hanzo
Seminar—3 hours; preparation and evaluation of research paper. Theories of fiction as reflected in the practice of writers from the eighteenth century to the present.

***235B. Theory of Fiction** (4) I.
Seminar—3 hours; preparation of a work of fiction and a critical explanation of it. Prerequisite: graduate standing in creative writing program. Investigation of fiction from the writer's, not the critic's view: choices, strategies, approaches, and the factors limiting those choices; also relation of the writer to his work.

***236. Poetics** (4) II.
Seminar—3 hours; conference—1 hour. Structure, prosody, and idiom of British and American poetry variably approached—sometimes through an intensive study of a single writer, sometimes historically or theoretically—at the instructor's discretion. Preparation and evaluation of research papers. Directed toward Creative Writing master's degree students.

237. Modern Critical Theory (4) II. Hanzo
Seminar—3 hours. Examination of problems in the theory underlying the practice of literary criticism from I.A. Richards and T.S. Eliot to the present.

240. Medieval Literature (4) II. Murphy
Seminar—3 hours; conference—1 hour. Studies of Medieval literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

242. Sixteenth-Century Literature (4) II. Schleiner
Seminar—3 hours; conference—1 hour. Studies in sixteenth-century literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

***244. Shakespeare** (4) I.
Seminar—3 hours; conference—1 hour. Studies in Shakespeare. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

***246. Seventeenth-Century Literature** (4) III.
Seminar—3 hours; conference—1 hour. Studies in seventeenth-century literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

248. Eighteenth-Century Literature (4) III. Hopkins
Seminar—3 hours; conference—1 hour. Studies in eighteenth-century literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

***250. Romantic Literature** (4) II.
Seminar—3 hours; conference—1 hour. Studies in Romantic literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

252. Victorian Literature (4) III, E. Gilbert
Seminar—3 hours; conference—1 hour. Studies in Victorian literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

254. Twentieth-Century British Literature (4) II. Hoffman
Seminar—3 hours; conference—1 hour. Studies in twentieth-century British literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

256. Early American Literature (4) I, Kramer
Seminar—3 hours; conference—1 hour. Studies in Early

NOTE: For key to footnote symbols, see page 123.

American literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

258. American Literature: 1800 to the Civil War (4) I, Martin
Seminar—3 hours; conference—1 hour. Studies in American literature from 1800 to Civil War. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

260. American Literature: Civil War to 1914 (4) II. Woodress
Seminar—3 hours; conference—1 hour. Studies in American literature from the Civil War to 1914. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

***262. American Literature after 1914** (4) II.
Seminar—3 hours; conference—1 hour. Studies in American literature after 1914. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

264. Studies in Modern British and American Literature (4) III. Hays
Seminar—3 hours; conference—1 hour. Studies in modern British and American literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

290F. Seminar in Creative Writing of Fiction (4) I, Murray; II, Baker; III, Murray
Seminar—3 hours; 1 additional hour of writing. Prerequisite: consent of instructor; graduate standing, with preference given to those enrolled in master's program in Creative Writing. Writing of prose. Evaluation of written materials and individual student conferences. May be repeated for credit.

290P. Seminar in Creative Writing of Poetry (4) I, II, III. S. Gilbert, Williamson
Seminar—3 hours; 1 additional hour of writing. Prerequisite: consent of instructor; graduate standing, with preference given to those enrolled in master's program in Creative Writing. Writing of poetry. Evaluation of written materials and individual student conferences. May be repeated for credit.

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Individual Study (1-12) I. II. III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Special Study for the Doctoral Dissertation (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

300. Problems in Teaching English Language, Literature and Composition in Secondary Schools (3) III. Harsh
Lecture-discussion—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.

302. Materials of Teaching English as a Second Language (ESL) (4) II. Schwabe
Lecture—3 hours; practice teaching—3 hours. Prerequisite: Linguistics 300. Design and development of classroom curricula and surveying/evaluating ESL materials combined with instructing classes in the ESL Clinic. Guided practice in teaching English pronunciation, grammar and sentence structure, listening comprehension and composition, discussion, and reading to foreign students.

303. Recent Research and Problems in ESL (4) III. Schwabe
Lecture—1 hour; practice teaching—2, 4, or 6 hours. Prerequisite: course 302. Analysis of a particular problem in teaching English as a second language (ESL) and testing possible solutions. Course work will include a review of literature in this area as well as presentation of a paper addressing problem/solution.

390. Teaching English at the College Level (4) I, Morris
Lecture—2 hours; discussion—2 hours. Prerequisite: graduate standing. Consideration of the problems and techniques of teaching composition and literature at the college level. (S/U grading only.)

392. Teaching Internship in English (2) I, II, III. The Staff (Coordinator of Writing Programs in charge)
Supervised internships—4 hours. Prerequisite: graduate standing. In-class internship with English Department faculty member. (S/U grading only.)

401. Editing "California Quarterly" (2) I, II, III. E. Gilbert
Seminar—2 hours; conference—1 hour. Prerequisite: participation in Creative Writing Program. Students will read all manuscripts submitted to *California Quarterly* and attend weekly editorial board meetings, choosing manuscripts for publication. They will also participate in copy-editing, copy-reading, layout, and other aspects of journal production. May be repeated for a total of 6 units. (S/U grading only.)

Entomology

(College of Agricultural and Environmental Sciences)

Robert K. Washino, Ph.D., Chairperson of the Department

Department Office, 367 Briggs Hall (752-0475)

Faculty

Oscar G. Bacon, Ph.D., Professor
Richard M. Bohart, Ph.D., Professor Emeritus
James R. Carey, Ph.D., Assistant Professor
Hugh Dingle, Ph.D., Professor
Sean S. Duffey, Ph.D., Associate Professor
Lester E. Ehler, Ph.D., Associate Professor
Norman E. Gary, Ph.D., Professor
Jeffrey Granett, Ph.D., Associate Professor
Albert A. Grigarick, Jr., Ph.D., Professor
Bruce D. Hammock, Ph.D., Professor *(Entomology, Environmental Toxicology)*
Charles L. Judson, Ph.D., Professor
Richard Karban, Ph.D., Assistant Professor
Harry K. Kaya, Ph.D., Professor
Harry H. Laidlaw, Jr., Ph.D., Professor Emeritus
W. Harry Lange, Jr., Ph.D., Professor Emeritus
Thomas F. Leigh, Ph.D., Adjunct Lecturer
Benjamin F. Lownsbery, Ph.D., Professor Emeritus *(Nematology)*
Armand R. Maggenti, Ph.D., Lecturer *(Nematology)*
G. A. H. McClelland, Ph.D., Professor
Donald L. McLean, Ph.D., Professor
Christine Y. S. Peng, Ph.D., Associate Professor
Timothy Prout, Ph.D., Professor *(Entomology, Genetics)*
Dewey J. Raski, Ph.D., Professor *(Nematology)*
Richard E. Rice, Ph.D., Adjunct Lecturer
Francis M. Summers, Ph.D., Professor Emeritus
Robbin W. Thorp, Ph.D., Professor
David R. Viglierchio, Ph.D., Lecturer *(Nematology)*
Philip S. Ward, Ph.D., Assistant Professor
Robert K. Washino, Ph.D., Professor
Lloyd T. Wilson, 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, nematology and transmission of plant and animal pathogens. Employment opportunities are available in managerial and technical positions with state and federal agencies and agricultural production or chemical companies. Some entomology graduates prepare to teach entomology and other biological sciences in high schools and junior colleges. Other graduates matriculate in graduate programs leading to a higher degree.

Entomology

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable and may be critical for the attainment of some career goals. *(Courses shown without parentheses are required.)*

Preparatory Subject Matter	**72-75**
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Mathematics 16A	3
Statistics	3
Computer science, Mathematics 16B, or additional statistics	3
Physics (Physics 1A, 1B)	6
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Zoology (Zoology 2, 2L)	6
Upper-division course in cell or microbiology (Bacteriology 102, Botany 114, Botany 119, Plant Pathology 120, Veterinary Microbiology and Immunology 132)	4-5
Genetics (Genetics 120)	4
Evolution (Genetics 103, Zoology 148)	3-4
Physiological chemistry (Physiological Sciences 101A-101B or Biochemistry 101A-101B)	6-7
Upper division electives courses in science (exclusive of entomology), and related to student's interest	8
Depth Subject Matter	**39-40**
General entomology, Entomology 100	5
Structure and function, Entomology 101A, 101B	8
Systematics, Entomology 103	4
Ecology, Entomology 104	4
Entomology 109, or Entomology 105 plus a collection course	7
Applied entomology, one course from Entomology 110, 112, 153	4
Two upper-division electives courses in entomology	7-8
Breadth Subject Matter	**39-41**
English (see College requirement)	4
Rhetoric (see College requirement)	4
Economics	5
Philosophy	4
At least one course from the following categories	7-9
(a) Anthropology, political science, psychology, or sociology	3-5
(b) Art or music	4
Electives in social sciences and humanities†	10-12
At least one course chosen from agrarian studies, geography, or geology	3-5
Unrestricted Electives	**24-30**
Total Units for the Major	**180**

Major Adviser. C. L. Judson.

Minor Program Requirements:

The Department of Entomology has seven minor programs open to students in other disciplines who are interested in rounding out their academic study with a concentration in the area of entomology or nematology.

	UNITS
Entomology	**18-19**
Entomology 100	5
At least two courses from Entomology 101A, 101B, 103, 104, 105, 106, 123	7-8
At least two additional upper division Entomology courses (except courses 192, 198, 199	6

	UNITS
Agricultural Entomology	**21-23**
Entomology 100, 110, 112	13
Two courses from Entomology 108, 118 or 120, 123, 125, 130, 140, 170	8-10

	UNITS
Apiculture	**18**
Entomology 100, 119, 119L, 121	14
Entomology 104 or 110	4
Additional courses recommended: Agronomy 120, Botany 102, Pomology 102.	

	UNITS
Insect Ecology	**20**
Entomology 100, 104	9
Seven units from Entomology 103, 105, 106, 109	7
One course from Zoology 149, Environmental Studies 121, 122	4

	UNITS
Insect Systematics	**20**
Entomology 100, 103, 105	12
Two courses from Entomology 106, 109, 116, 123	8

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 123.

	UNITS
Medical-Veterinary Entomology	**18**
Entomology 100, 104, 153, 156	16
At least two units from Entomology 155, 156L, Veterinary Microbiology 126, 126L, 128, 132	2

	UNITS
Nematology	**18-20**
Nematology 100, 110; 130 and/or Veterinary Microbiology 132	10-15
Two or three courses from one of the following areas	5-8
(a) Plant Science: Bacteriology 101, Botany 120, 121, Entomology 100, 125, 140, 153, 156, 156L, Soil Science 111, Zoology 112A, 142.	
(b) Entomology: Bacteriology 101, Botany 120, 121, one upper division Entomology course, Plant Science 125, Soil Science 100, 111, Zoology 112A, 142.	

Minor 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 105 and the *Graduate Announcement* for further details.

Graduate Advisers. See *Class Schedule and Room Directory.*

Related Courses. See courses in Nematology.

Courses in Entomology

Lower Division Courses

10. Natural History of Insects (3) II. Bacon
Lecture—3 hours. Designed for students not specializing in entomology. Not open for credit to students who have had course 100 but students who have taken this course may take course 100 for credit. An introduction to the insects detailing their great variety, structures and functions, habits, and their significance in relation to plants and animals including man.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. General Entomology (5) I, Thorp
Lecture—3 hours; laboratory—6 hours; optional Saturday field trips to be arranged. Prerequisite: Biological Sciences 1 or the equivalent. Biology of insects including: morphology, physiology, development, ecology, classification of orders and common families, and relation to human welfare.

101A, 101B. Insect Structure and Function (4-4) A:I; B:II. Judson, Peng
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100; Chemistry 8B recommended; (course 101A recommended prior to 101B.) Principles of evolutionary, functional and comparative aspects of insect morphology, and study of the mechanisms and processes by which insects maintain themselves and adapt to the environment. Laboratory sessions cover basic insect structure and introduce research principles and techniques.

103. Systematic Entomology (4) III. Ward.
Lecture—2 hours; laboratory—6 hours. Prerequisite: introductory course in zoology or entomology. The principles of animal taxonomy; speciation; introduction to classification and nomenclature.

104. Insect Ecology (4) II. Karban
Lecture—3 hours; discussion—1 hour. Prerequisite: a general biology course. Principles of animal ecology with emphasis on insect population dynamics: analysis of factors influencing distribution and abundance. Application of basic theory to management of pest insect populations with focus on biological control and related approaches. Community structure and dynamics.

105. Insect Classification (3) II. Thorp, Grigarick, Ward
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 100. Principles and methods of classification of insects to the family level with emphasis on identification.

106. Field Entomology (4) III. Thorp
Laboratory—6 hours; weekend field trips—8-10 days. Prerequisite: course 105 or consent of instructor. Collection and comparative analysis of insect faunas from selected ecological zones in California. Offered in odd-numbered years.

108. Chemical Control of Insects (4) II. Granett
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110 or 112, Chemistry 8A, 8B; Biochemistry or Animal Physiology recommended. Study of chemicals used to control insects and mites with regard to mode of action, chemistry, metabolism and applied uses, particularly within an integrated control framework. Chemical-insect and chemical-environment interactions. Practical aspects of chemical use.

109. Field Taxonomy and Ecology (7) Extra-session summer. Ward
Lecture—2 hours; laboratory—36 hours; five-week course. Prerequisite: an introductory course in entomology or consent of instructor. The study of insects in their natural habitats; their identification and ecology. Offered in even-numbered years.

110. Economic Entomology (4) I, Grigarick.
Lecture—2 hours; laboratory—6 hours. 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 Crop Pest Management (4) II. Wilson
Lecture—3 hours; laboratory—3 hours. Prerequisite: upper division standing in one of the biological sciences; course 100 or 110. Comprehensive overview of principles of crop pest management with a focus on processes involved with the development of strategies and tactical crop pest management decision criteria. Representative crops, including alfalfa, cotton, grapes, and tomatoes covered in detail.

116. Biology of Aquatic Insects (3-5) III. Grigarick
Lecture—2 hours and laboratory (Saturday field trips); optional laboratory on identification and/or aquatic insect collection. Prerequisite: course 100 or consent of instructor. A study of the life history, ecology, and identification of insects associated with streams, ponds, and lakes.

118. Crop Resistance to Arthropod Pests (4) III. Leigh
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 110 or the equivalent and upper division standing; additional entomology, genetics and plant science courses recommended. An introduction to host plant resistance as a durable and efficient technique applicable to pest management systems. Procedures and methods. Designed for students in agricultural entomology and crop production. Offered in odd-numbered years.

119. Apiculture (3) II. Gary
Lecture—3 hours. Biology and behavior of honeybees; communication, orientation, social organization, foraging activities, honey production, pollination activities.

119L. Apiculture Laboratory (2) III. Gary
Discussion—1 hour; laboratory—3 hours; field trips taken primarily during laboratory time. Prerequisite: course 119 or consent of instructor. Biology and behavior of honey bees; fundamentals of culture, management, and use of colonies for agricultural, recreational, teaching, and research purposes. Field trips to industrial activities.

120. Insect-Host Plant Interactions (4) II. Duffey
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101A-101B; Biochemistry 101A-101B or the equivalent; general introductory course in botany and/or plant physiology will be helpful. Morphological, physiological and biochemical bases of host-plant selection by insects; consideration of bases of host-plant resistance to insects. Emphasis on comparative defensive biochemical interaction between various organisms particularly plants and insects.

121. Insect Behavior (4) II. Dingle
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in one of the biological sciences and one course in entomology or consent of instructor. Mechanisms of insect behavior; includes physiological basis for behavior, specific patterns and types of behavior, comparative studies, learning and evolution of behavior.

123. Classification of Immature Insects (4) III.
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 mycroplasmas. Offered in odd-numbered years.

130. Biological Control (4) I, Ehler
Lecture—3 hours; discussion—1 hour. Prerquisite: course 100 or consent of instructor. Theory and practice of biological control of arthropod pests; biology of entomophagous arthropods, role of insects in weed control, microbial control of insects and mites

140. Insect Pathology (4) III. Kaya
Lecture—3 hours; laboratory—3 hours. Prerequisite: introductory course in entomology and at least one course in a microbiological science. Principles of insect pathology and insect microbiology; noninfectious and infectious diseases of insects, diagnosis, epizootiology, therapy, and microbial control.

153. Medical Entomology (4) I, McClelland
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in one of the biological sciences or consent of instructor. The worldwide relationships of insects and other arthropods to human health. The biology and basic classification of medically important arthropods with special emphasis on the ecology of arthropod-borne human diseases and principles of their control.

155. Management of Medically Important Arthropods (3) I, Washino
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 153. 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. Offered in odd-numbered years.

156. Biology of Parasitism (3) III. Washino in charge; Theis (Medical Microbiology), Lavoipierre (Epidemiology and Preventive Medicine), Maggenti (Nematology)
Lecture—3 hours. Prerequisite: Biological Sciences 1 or consent of instructors. Lectures on the biological and ecological aspects effecting host-parasite relationships using selected examples from protozoan and metazoan fauna.

156L. Biology of Parasitism Laboratory (1) III. Washino, in charge; Theis (Medical Microbiology), Lavoipierre (Epidemiology and Preventive Medicine), Maggenti (Nematology)
Laboratory—3 hours. Prerequisite: course 156 (concurrently) or consent of instructor. Laboratory demonstrations using selected examples of protozoan and metazoan organisms along with various techniques used in parasitology to exemplify concepts presented in the lecture course.

***170. Insect Pest Management** (6) Extra-session summer. Leigh, Rice
Lecture—60 hours total; laboratory and field trips—100 hours total. Prerequisite: upper division standing and at least one course in agricultural entomology or insect ecology. Field course in pest management principles and practices. Students participate in detection and sampling for pest and beneficial species and evaluation of damage; and also plan and conduct experiments utilizing biological, chemical, and cultural control methods.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the Department of Entomology. Internships supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III, summer. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Quantitative Insect Ecology (4) III. Carey
Lecture—3 hours; laboratory—3 hours. Prerequisite: Mathematics 16B; course in ecology. Mathematical methods and analytical techniques in insect ecology. Use of mathematical demography, analytical modeling, numerical methods, and elementary population genetics in evaluating natural and economically important arthropod populations. Offered in even-numbered years.

202. Advanced Insect Physiology (2) III. Judson
Lecture—2 hours. Prerequisite: course 101B or the equivalent or consent of instructor; Biochemistry 101A or 101B recommended. Selected topics of insect physiology. Intensive study of topics of current interest, which will vary from year to year. Course may be repeated for credit. Offered in odd-numbered years.

205. Insect Demography (3) III. Carey
Lecture—3 hours. Prerequisite: introductory ecology; one quarter calculus; or consent of instructor. Concepts and methods of mathematical demography as applied to insect populations; reasoning behind demographic calculations and mechanisms of calculations stressed. Offered in odd-numbered years.

207. Genetic Control of Insect Pests (3) II. Prout
Lecture—3 hours. Prerequisite: elementary genetics, plus population genetics or evolutionary theory; graduate or upper division standing in biological science; some knowledge of insect ecology and model construction recommended. Application of population genetic theory to ways of altering the genetic constitution of pest populations: including sterile male release, delayed sterility methods, sex ratio distortion, the use of various cytogenetic procedures and meiotic drive to transform populations. Offered in even-numbered years. (S/U grading only.) (Same course as Genetics 207.)

NOTE: For key to footnote symbols, see page 123.

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.

227. Acarology (4) I, Ehler
Lecture—2 hours; laboratory—6 hours. Prerequisite: graduate or upper division standing in biological science; courses 100, 103. Systematics, ecology, morphology, physiology and evolution of mites; management of pest species discussed but not empahsized. Offered in odd-numbered years.

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 (3) III. McClelland
Lecture—2 hours; discussion—1 hour. Prerequisite: one course in entomology (other than course 153) and one course in microbiology; course 153 strongly recommended. An analysis of several anthropod-borne human diseases with emphasis on the relationships of the biology of the vector to the ecology of the disease. Discussion includes demonstration of vectors and techniques. Offered in odd-numbered years.

255. Electrical Principles Related to Biological Research (4) II. McLean
Lecture—3 hours; laboratory—3 hours. Prerequisite: course in college physics; graduate standing in a biological science or consent of instructor. Basic electrical principles of ac and dc circuits. Methods of electrical measurements, discussion of semiconductor devices, and basic circuits of power supplies, amplifiers, oscillators, and electronic switching are presented in relation to biological measurement systems. Offered in even-numbered years.

298. Special Topics in Entomology (1-4) I, II, III. The Staff (Ehler in charge)
Seminar—1-4 hours. Prerequisite: consent of instructor.

291. Seminar in Medical Entomology (2) I, McClelland, Washino
Seminar—2 hours. Prerequisite: course 153. Discussions of parasitology, ecology and epidemiology related to vectors of pathogens causing disease in man and animals.

292. Seminar in Insect Physiology (2) I, Judson, McLean, Duffey, Hammock
Seminar—2 hours. Prerequisite: course 101B. Critical examination of areas of current interest to insect physiology and biochemistry.

293. Seminar in Systematic Entomology (2) III. Ward, Thorp
Seminar—2 hours. Prerequisite: course 103. Selected topics in systematics and evolution are presented and discussed. Some topics may be illustrated by laboratory sessions.

294. Seminar in Insect Ecology (2) III. Carey, Ehler, Karban
Seminar—2 hours. Prerequisite: a general ecology course. Discussions of advanced topics in ecology with emphasis on analysis of factors influencing the distribution and abundance of insects. Includes consideration of applications of basic theory as in biological control and related approaches.

295. Seminar in Agricultural Entomology (2) I, II. Bacon, Grigarick, Granett, Wilson
Seminar—2 hours. Prerequisite: course 110. Discussion of advanced topics relating to the principles of pest insect population management.

296. Seminar in Bee Biology (2) I, Thorp, Gary, Peng
Seminar—2 hours. Prerequisite: course 119 or the equivalent. Discussions of behavior, ecology, management, and general biology of bees (Apoidea) with emphasis on the honeybee.

297. Seminar in Insect Behavior (2) II. Gary, Dingle
Seminar—2 hours. Prerequisite: course 121. Review and critical analysis of contemporary advances in insect behavior, especially interpretation and description of observations, physiological mechanisms, functional kinds of behavior, and the application of general principles to the solution of problems in the laboratory and field.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III, summer. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

401. Scientific Writing for Entomologists (2) II. McClelland, Ehler
Lecture—1 hour; laboratory—2 hours. Prerequisite: advanced graduate standing in Entomology; English 104.† Techniques of scientific writing with emphasis on clear thinking and the steps from research to completed journal manuscript. Examples will be drawn from Entomology.

402. BASIC Programming for Entomologists (2) II. McClelland
Lecture—1 ½hours; laboratory—1 hour. Prerequisite: graduate standing; a statistics course.† Programming in BASIC with application to the Wang 2200 minicomputer or other available system. Emphasis on techniques for data processing and analysis.

403. Oral Presentation of Scientific Information (1) I, Granett, Duffey
Lecture-discussion—2 hours every other week. Prerequisite: graduate standing.† Helps students in preparing information for (1) 8- to 10-minute talks at scientific meetings, (2) research seminars, (3) class lectures, and (4) impromptu talks.

404. Grantsmanship (2) III, Granett
Lecture—1 hour; 15-20 page research proposal required. Prerequisite: graduate standing; research experience.† Develops in students an awareness of options and strategies in writing research proposals. Students write a full length research proposal.

405. Bioassay Techniques (1) II. Granett
Lecture—5 hours (total); laboratory—15 hours (total). Prerequisite: graduate standing; course 108 recommended.† Familiarizes students with the theory and practice of insect bioassays as they are used in entomology, particularly with insecticides.

406. Analysis of Natural Products (2) I, Duffey
Lecture—½ hour; discussion—½ hour; laboratory—2 hours. Prerequisite: Biochemistry 101B.† Familiarizes students with basic methods of isolating, identifying and bioassaying natural products.

407. Scanning Electron Microscopy (1) III. Schuster
Lecture—5 hours total; laboratory—6 hours total; individual project. Prerequisite: graduate standing or consent of instructor.† Introduction to basic operation theory of scanning electron microscopes (SEM) in the secondary emissive mode: preparation of samples for examination by SEM; practical emissive mode: preparation of samples for examination by SEM; practical application of SEM to produce information emphasizing photographic images of publishable quality. Offered in odd-numbered years.

Environmental Design

(College of Agricultural and Environmental Sciences)

Helge B. Olsen, Chairperson of the Department

Department Office, 144 Walker Hall (752-6223)

Faculty

Richard Berteaux, B.Arch., M.S., Associate Professor
[1]Frances Butler, M.A., Professor
Kerry J. Dawson, M.L.A., Associate Professor
Paul Deering, M.L.A., Visiting Lecturer
Mark Francis, M.L.A., Associate Professor
[2]Dolph Gotelli, M.A., Associate Professor
Gyongy Laky, M.A., Associate Professor
E. Byron McCulley, B.S.L.A., Visiting Lecturer
[3,4]Helge B. Olsen, Senior Lecturer
Victoria Z. Rivers, M.A.C.T., S.C.T., Associate Professor
Katherine W. Rossbach, M.A., Professor Emeritus
Barbara Shawcroft, M.F.A., Professor
[1]JoAnn C. Stabb, M.A., Lecturer
Robert L. Thayer, Jr., M.A., Associate Professor

Programs of Study. See the majors in Design (page 166) and Landscape Architecture (page 239).

Related Courses. See Design and Landscape Architecture.

Environmental Horticulture

(College of Agricultural and Environmental Sciences)

Roy M. Sachs, Ph.D., Chairperson of the Department

Department Office, 140 Environmental Horticulture Building (752-0130)

Faculty

Alison M. Berry, Ph.D., Assistant Professor
David W. Burger, Ph.D., Assistant Professor
Thomas G. Byrne, M.S., Adjunct Lecturer
William B. Davis, M.S., Adjunct Lecturer
Seymour M. Gold, Ph.D., Professor
(Environmental Planning and Management)
James A. Harding, Ph.D., Professor
Richard W. Harris, Ph.D., Professor
Raymond F. Hasek, Ph.D., Adjunct Lecturer
Charles E. Hess, Ph.D., Professor
Anton M. Kofranek, Ph.D., Professor
Harry C. Kohl, Jr., Ph.D., Professor Emeritus
Andrew T. Leiser, Ph.D., Professor
John H. Madison, Jr., Ph.D., Professor Emeritus
James D. MacDonald, Ph.D., Assistant Professor
(Plant Pathology)
Jack L. Paul, Ph.D., Professor
Michael S. Reid, Ph.D., Associate Professor
Warren G. Roberts, M.S., Adjunct Lecturer
Roy M. Sachs, Ph.D., Professor
Lin L. Wu, Ph.D., Associate Professor

Related Undergraduate Programs and Graduate Study. See the undergraduate majors in Environmental Planning and Management (page 206) and Plant Science (page 289); and for graduate study see page 94.

Related Courses. See Plant Science.

Courses in Environmental Horticulture

Lower Division Courses

6. Introduction to Environmental Plants (3) III.
Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 2. Growth, form, and origin of plants used in landscape and home discussed in relation to their uses and climatic and cultural requirements. Students learn to identify environmental plants.

10. Landscape Horticulture for the Home and Community (3) III. Kofranek
Lecture—2 hours; discussion—1 hour. Recommended for non-majors. Influences of climate, soil, and cultural practices on the growing of turf, flowers, and herbaceous and woody plants in the landscape.

92. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing, Botany 2 or Plant Science 10 or 2, and consent of instructor. Work-learn experience off and on campus in flower and nursery crop production, and marketing; landscape horticulture; and park management. Internships supervised by a member of the faculty. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Sachs in charge)
(P/NP grading only.)

Upper Division Courses

105. Taxonomy and Ecology of Environmental Plants (4) I, Leiser
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 6 or one course in taxonomy. Taxonomy of the important plants used in the western landscape. Emphasis will be placed on the identification, nomenclature, characteristics and uses of woody plants in man's environment.

107. Herbaceous Environmental Plants (3) III. Harding
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.

NOTE: For key to footnote symbols, see page 123.

***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. Nomenclatural codes are discussed. Offered in odd-numbered years.

120. Management of Container Soils (3) I, Paul
Lecture—2 hours; laboratory—3 hours. Prerequisite: Soil Science 100. Appropriate use of sand, mineral soil and amendments to formulate container soils. Management of container soils emphasizing irrigation, salinity control and fertilizer practices.

125. Flower Crop Production and Marketing (4) II. Kofranek
Lecture—3 hours; laboratory—3 hours; one two-day field trip. Prerequisite: course 120; Plant Science 2. The technology of planning, growing, and marketing flower crops, particularly greenhouse crops, as an application of principles. Major flower crops are considered in detail.

126. Nursery Management (2) III. Burger
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.

130. Turfgrass Culture (3) III. Wu
Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2 or Botany 2 and Soil Science 100. Professional turfgrass culture and management emphasizing: turf species and cultivars, physiological differences between turfgrass species, the interaction between turfgrass and the environment, and management practices.

133. Arboriculture (4) II. Harris
Laboratory—3 hours; discussion-testing—4 hours. Prerequisite: Plant Science 2 or Botany 2. Principles and practices of selecting, planting and maintaining trees, shrubs and vines in urban and natural landscapes. Course given in Personalized System of Instruction format. Students should enroll when juniors if they wish to assist with the course next year.

155. Plant Selection for Environmental Design (3) II.
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 6 and Landscape Architecture 40. 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.

***175. Biomass Feedstocks for Fuels** (2) I, Sachs
Lecture—2 hours; field trips. Prerequisite: Plant Science 101 or Agronomy 100 or Botany 111A; senior or graduate standing and consent of instructor. Detailed account of silvicultural, agricultural and urban biomass resources for fuel production.

192. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units, two upper-division courses in Environmental Horticulture appropriate for the internship and consent of instructor. Work-learn experience off and on campus in flower production and marketing, nursery crop production and marketing; landscape horticulture; and park management. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Environmental Horticulture (1-4) I, II, III. The Staff
Hours and duties will vary depending on course tutored. Prerequisite: upper division standing, completed course or the equivalent being tutored, and consent of instructor. Leading discussion sections, conducting laboratory exercises or proctoring in personalized-system-of-instruction-format classes under faculty guidance. Weekly conferences on subject matter and instructional techniques. May be repeated once for credit if different course is tutored.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. Selected problems in floriculture, nursery management, and landscape horticulture. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. (P/NP grading only.)

Graduate Courses

241. Analysis of Horticultural Problems (3) III. Paul
Lecture—1 hour; laboratory—6 hours. Prerequisite: a B.S. degree (or the equivalent) in Plant Science or consent of instructor. Diagnosis of ornamental plant disorders. Emphasis on distinguishing among disorders caused by soil, water, insects, pathogens, chemical agents, climatic conditions and cultural practices using visual symptoms and circumstances for determining probable cause and laboratory methods for confirmation.

251. Modeling Productivity of Greenhouse Flower Crops (3) II. Kohl
Lecture—2 hours; discussion—1 hour. Prerequisite: course 125; Plant Science 101. Course will introduce students to system modeling using the DYNAMO computer program. Economically important production parameters of greenhouse flower crops will be studied and experience will be gained in using computer models to maximize economic flower crop production.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Selected topics in floriculture, nursery management, and environmental horticulture.

290C. Research Group Conference (1) I, II, III. Reid, Sachs, Wu
Discussion—1 hour. Prerequisite: students in a plant science graduate program. Research conference conducted by Departmental faculty to discuss design, philosophy and interpretation of ongoing specific research areas which includes plant morphogenesis, floriculture, greenhouse production, landscape plant ecology, arboriculture, turf culture, post harvest, and plant breeding related to environmental horticulture. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Sachs in charge)
Group study on advanced topics in floriculture, nursery management, and environmental horticulture.

299. Research (1-12) I, II; III. The Staff (Sachs in charge)
Prerequisite: graduate standing. Research in floriculture, nursery management, and environmental horticulture. (S/U grading only.)

Environmental Planning and Management

(College of Agricultural and Environmental Sciences)

Faculty

See under the Division of Environmental Studies.

The Major Program

The Environmental Planning and Management major provides opportunities to study the relationships between people and the environment through the Park Administration and Interpretation option. Employment opportunities in the public or private sector that may be available to graduates are illustrated below. Graduate study or experience may be essential for some occupations. The Park Administration and Interpretation option emphasizes the techniques used to provide, develop and manage public and private parks, recreation and open spaces. Graduates in the Park Administration and Interpretation option can expect career opportunities such as: directors of park systems, park rangers, park and resort managers, museum directors, park naturalists, outdoor education specialists, recreation supervisors and planners, and environmental planners and consultants with government agencies and private industry.

The Environmental Planning and Management advisers recommend career experience through work-learn internships, summer jobs, or planned educational leave 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. Equivalent or more advanced courses may be taken with the adviser's approval. *Courses shown without parentheses are required.)*

	UNITS
Core Courses (Lower Division)	**61**
Chemistry (Chemistry 1A or 10)	4†
Physics (Physics 1A, 2A or 10)	3†
Earth sciences (Geography 1, Geology 1, Soil Science 100)	6†
Biology (Biological Sciences 1 or 10)	4†
Mathematics (Computer Science Engineering 8, 20, Mathematics 16A, 16B, 36, Statistics 13, or Agricultural Science and Management 150)	6†
Environmental issues (Environmental Studies 10, Environmental Toxicology 10 or Resource Sciences 100)	3†
Landscape architecture, 40, 111	7
Economics (Economics 1A or 1B)	5
Other social sciences, introductory courses in at least two of the following subject areas: cultural anthropology (Anthropology 2), human geography (Geography 2, 5), psychology (Psychology 1, 16), sociology (Sociology 1)	11†
Expository writing (English 1)	4
Public speaking (Rhetoric 1 or 3)	4
Humanities elective	4
Core Courses (Upper Division)	**12**
Urban and regional planning (Environmental Planning and Management 110)	4
Outdoor recreation, Environmental Planning and Management 116 or 127	4
General ecology, Environmental Studies 100 or 110	4
Park Administration and Interpretation Option	**79**
Biological science, Botany 2	5
Botany, plant science, wildlife and fisheries biology, zoology	3†‡
Environmental plants, Environmental Horticulture 6	3
Resource management, at least five courses chosen from Environmental Horticulture 105, 130, 133, 155, Environmental Planning and Management 129, 144, or courses in geology, meteorology, range management, water science or soil science	16†‡
Economics, Agricultural Economics 147, 148, Economics 125A or 125B	4
Communications, Environmental Planning and Management 125	4
Environmental Planning and Management 160A or upper division course in applied behavioral science, English, or rhetoric	3†‡
Public administration, Agricultural Economics 112, Political Science 180-189	4
Park administration, Environmental Planning and Management 122	4
Recreation planning, Environmental Planning and Management 134 or Landscape Architecture 112	4†
Individual requirements	29†‡
Unrestricted Electives	**28**
Total Units for the Major	**180**

Major Adviser: ——— *(Environmental Studies).*

Courses in Environmental Planning and Management

Questions pertaining to the following courses should be directed to the instructor or to the Environmental Planning and Management advising office, 2132 Wickson Hall.

Lower Division Courses

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

99. Special Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

†Minimum units are indicated. If more units are taken in order to meet this unit requirement, the extra units may be counted as individual requirements if approved by an adviser. Additional courses in the same subject to be used as individual requirements must be approved by an adviser.

‡Courses are selected to complement each student's program in this major. The list of courses to be used as *individual requirements* must have the adviser's approval no later than Winter Quarter of the junior year.

NOTE: For key to footnote symbols, see page 123.

Upper Division Courses

110. Urban and Regional Planning (4) II. Gold (Environmental Planning and Management)
Lecture—3 hours; discussion—1 hour; one Saturday field trip. Prerequisite: upper division standing. The history, nature, scope and significance of planning in America with emphasis on basic definitions and concepts, the planning process and comprehensive plan, significant problems and potentials, design alternatives, the future, innovation and the profession.

***116. Outdoor Recreation** (4) I. The Staff
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. The Staff
Lecture—3 hours; discussion—1 hour; Saturday field trip. Prerequisite: course 116. Description and analysis of the nature, concepts and techniques of providing leisure opportunities with emphasis on the policies, programs, and organization of park and recreation systems.

125. Technology Transfer and Innovation (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Rhetoric 1 or 3 and English 1. Students learn to reason from technology transfer, innovation diffusion, and organizational communication principles to develop communication strategies to introduce new ideas such as energy conservation, agricultural practices, etc., into social systems.

127. Leisure Behavior (4) III. The Staff
Lecture—2 hours; discussion—2 hours. Prerequisite: course 116; course 125 recommended. Investigation of selected leisure environments and resultant behavior. Analysis of leisure behavior from a motivational base. Historical analysis of different leisure environments cross-culturally.

***129. Research Methods for Planning and Management** (4) II. The Staff
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Statistics 13. Applying survey research design and measurement methodology to collection of data needed for planning and managing the environment. Processing and analysis of data using computer facilities. Developing the ability to evaluate published research results.

134. Recreation Planning (4) III. Gold
Lecture—3 hours; discussion—1 hour; one Saturday field trip. Prerequisite: courses 110, 116. Description of basic concepts, principles, techniques and methods used to prepare park, recreation and open space plans for urban environments.

***144. Park and Landscape Management** (4) III. Harris
Lecture—3 hours; laboratory—3 hours; one all day field trip. Prerequisite: Environmental Horticulture 130 and/or 133 and Agricultural Economics 112 and/or course 122 recommended. Planning, implementation, and supervision of landscape and facility maintenance and operations emphasizing management approaches including employee involvement, resource inventory, task descriptions, time standards, scheduling, and monitoring. Familiarization with techniques and technology to develop, maintain, and operate landscaped and recreation facilities.

160A. Environmental Interpretation Principles (3) II. The Staff
Lecture—3 hours. Prerequisite: Rhetoric 1 or 3 and English 1 or 104 recommended. Application of communication theories and principles to environmental interpretation with emphasis on park and recreation interpretation, museums, historic areas, botanical and zoological gardens. Emphasis on reasoning to interpretive strategies from theory and principles.

160B. Environmental Interpretation Methods (3) III. The Staff
Lecture—1 hour; laboratory—6 hours (3 hours to be arranged). Prerequisite: course 160A; English 104 recommended. Interpretation development and operations. Students learn to plan, produce, present, maintain and evaluate interpretive programs. Includes instruction in the use of selected interpretive media.

192. Internship in Environmental Planning and Management (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: upper division or graduate standing, completion of upper division coursework relevant to the internship topic and consent of instructor. Students apply theory and principles learned in classroom instruction to applied problems under supervision of both a faculty adviser and a professional sponsor. Students must consult with a faculty adviser before applying for an internship. (P/NP grading only.)

***196. Environmental Planning and Management Study Tour** (4) I. The Staff
Field trips—6-10 hours per day; evening seminar session (2 to 3 weeks following trip). Prerequisite: course 110 or 116; consent of instructor. Study tour, 14 to 17 days prior to the beginning of fall quarter. Observe, analyze and evaluate the planning, design, management and programs of recreation and other urban environments with emphasis on administrative processes, interpretive methods, program innovations. (Reservations required in May preceding Fall Quarter.) (P/NP grading only.) Offered in even-numbered years.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: 3 units of upper division work in park administration; consent of instructor. (P/NP grading only.)

Graduate Courses

***222. Recreation Policy** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 122 or consent of instructor. Analysis of the development and application of public policy of recreation resource allocation, development and management. Offered in even-numbered years.

***234. Recreation Planning** (4) III. Gold
Lecture—2 hours; discussion—1 hour; laboratory—3 hours; one Saturday field trip. Prerequisite: courses 110, 116, 122, 134 or consent of instructor. Application of basic and advanced concepts, techniques and methods used to prepare park, recreation and open space plans for urban environments. Offered in odd-numbered years.

290. Seminar (1-2) I, II, III. The Staff (Chairperson in charge)
Seminar—1-2 hours. An interdisciplinary seminar on selected current topics related to environmental planning, leisure behavior and environmental quality.

299. Research (1-6) I, II, III. The Staff (Chairperson in charge)
Research—3-18 hours. (S/U grading only.)

Environmental Policy Analysis and Planning

(College of Agricultural and Environmental Sciences)

The Major Program

Environmental Policy Analysis and Planning seeks to develop an understanding of both techniques for evaluating, and the factors affecting, governmental policy-making in a variety of fields related to environmental quality. This major is designed to produce students with (1) a general background in the natural sciences relevant to environmental policy; (2) sufficient training in mathematics, statistics, and research methodology to quantitatively analyze environmental problems and policy options; (3) a strong background in the field of policy analysis, involving both the evaluation of policy alternatives and an understanding of the factors affecting policy formulation and implementation by governmental institutions. In addition, students will be encouraged to develop (4) substantive knowledge in a specific field of environmental policy such as air pollution control, water quality planning, urban and regional planning, or energy development.

The major is oriented toward both (1) students who will acquire the analytical skills and broad background in the social and natural sciences needed for employment in public agencies, consulting firms, and businesses concerned with environmental affairs, and (2) preprofessionals who will go on to graduate work in law, planning, public policy, or environmental science having both a wide background in the social and natural sciences and a fairly extensive background in a functional policy area. It is anticipated, however, that most career-oriented graduates will eventually seek an advanced degree.

The course requirements are designed to provide both the basic substantive knowledge and analytical skills necessary for a quality program in environmental policy analysis and planning. Although certain courses are stipulated for all students involved in the program, the emphasis is on required units within categories of courses. This recognizes the wide variety of students' interests and the changing content and quality of specific courses from year to year. It is very important, however, that students develop a close relationship with their own advisers in order that the preparatory and depth courses selected be appropriate to each student's interests and desired area of specialization.

Environmental Policy Analysis and Planning

B.S. Major Requirements:

(Courses in parentheses are those normally taken. Very similar or more difficult courses may be taken with the approval of your adviser. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter†	**54-58**
Mathematics (Mathematics 16A, 16B, 21A, 21B)	6-8
Statistics (Statistics 13, 32)	3-4
Physics (Physics 1A, 2A)	3
Chemistry (Chemistry 1A, 1B)	10
Biology (Biological Sciences 1)	5
Environmental science and agriculture (Soil Science 100; Water Science 100; Botany 2; Zoology 2; Agronomy 21; Agricultural Economics 1; Geology 1; Plant Science 10; Animal Science 1; Water Science 104)	3-5
American politics (Political Science 1)	4
Micro- and macro-economics (Economics 1A, 1B)	10
Computation (Engineering 5, Computer Science Engineering 8, 20)	3
Introduction to environmental analysis (Environmental Studies 1)	4
Adjunct writing course (English 102—concurrently with Environmental Studies 1)	3
Breadth Subject Matter	**16**
Communication skills, English 1 (see College requirement, page 71)	8
Social sciences and the environment (Sociology 102, Environmental Studies 101, 141, Psychology 144, Comparative Literature 20, History 85, Applied Behavioral Sciences 162)	4
Social sciences and humanities electives‡	4
Depth Subject Matter††	**47-48**
(a) Core Courses	
Policy analysis, Environmental Studies 160	4
Law, Environmental Studies 161 or 173	4
Bureaucratic policymaking, Environmental Studies 166	4
Policy evaluation, Environmental Studies 168A	4
Environmental planning and impact assessment, Environmental Studies 171 or 179	3-4
Environmental science, Environmental Studies 110	4
(b) Research Methods	
Ethics and normative reasoning, Philosophy 114A, 114B or 117	4
Research design, Environmental Studies 178 or Sociology 103 or Environmental Planning and Management 129	4
Statistics, Sociology 106 or Political Science 114 or Statistics 102	4
(c) Economic Analysis	
Microeconomics, Economics 100	5
Urban and public economics, Economics 125A or 125B or 131	4
Resource economics, Agricultural Economics 176	3
Areas of Specialization	**16-21**
City and Regional Planning Option	
Urban design (Art 168, 184, 188B; Landscape Architecture 111)	4

†These are minimum requirements. Additional courses may be necessary to meet prerequisites for upper division courses in some areas of specialization.

‡Units earned in satisfaction of American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

††Courses in Depth Subject Matter may not be taken on the P/NP grading basis.

NOTE: For key to footnote symbols, see page 123.

Urban geography (Geography 155, 156) 4
Transportation and civil engineering planning (Civil Engineering 152, 160) 3
Environmental impact assessment (Soil Science 118, Geolcgy 134, Civil Engineering/ Geology 175, Environmental Studies 179) ..3-4
Urban politics (Political Science 102, 100) 4
(Enroll for Environmental Studies 173 for law requirement under Depth Subject Matter above.)

Water Quality Planning Option

Environmental health (Environmental Studies 126) 4
Water pollution (Water Science 41, 103, 180) 3-4
Hydrology (Water Science 141) 3
Water law (Water Science 150) 3
Wastewater treatment (Civil Engineering 148A). 3
Project evaluation (Agricultural Economics 148) 3

Air Pollution Control Policy Option

Environmental health (Environmental Studies 126). 4
Aerosol toxicology (Environmental Toxicology 131) 3
Pollution control (Civil Engineering 149A) 3
Meteorology (Resource Sciences 131) 3
Fluid mechanics (Engineering 103A) 3

Energy Policy Option

Environmental health (Environmental Studies 126; Environmental Toxicology 131) 3-4
Nuclear hazards (Environmental Studies 115) 3
Energy policy (Environmental Studies 167) 4
Economics of energy (Environmental Studies 169) 3
Energy technology (Engineering 160, 162) 4
Solar energy (Resource Sciences 103) 3

Environmental Science Option

Environmental health (Environmental Studies 126; Environmental Toxicology 101) 3-4
Soils and land use (Soil Science 118; Geology 134) 3-4
Aquatic systems (Environmental Studies 116, 151; Water Science 41, 103, 141, 180) 3-4
Meteorology and air pollution (Resource Sciences 131 or Civil Engineering 149A) 3
Science policy (Environmental Studies 165) 4

Advanced Policy Analysis Option

Political institutions (Political Science 102, 105, 108, 159) 4
Political behavior (Political Science 164, 165, 170) 4
Science policy (Environmental Studies 165) 4
Policy evaluation research (Environmental Studies 168B) 4
Policy evaluation (Civil Engineering 153, 160; Agricultural Economics 148; Economics 130) 3-4

Unrestricted Electives 37-47
Students will be urged to take internships, when appropriate to their educational needs.

Total Units for the Major 180

Major Adviser. S. I. Schwartz (Environmental Studies).

Minor Program Requirements

The faculty for environmental policy analysis and planning offers the following two minors. The Energy Policy minor is for students from any major seeking basic training in energy technology, impacts and policy analysis methods applied to energy systems. The second minor is intended for natural and social science students desiring basic training in policy analysis theory and methods.

	UNITS
Energy Policy	**16-18**
Preparation: Economics 1A; basic course in political science.	
Environmental Studies 20 or Engineering 160	3-4
Environmental Studies 126 or Environmental Toxicology 101	3-4
Resource Sciences 103 or Environmental Studies 115	3
Environmental Studies 169	3
Environmental Studies 167 or Political Science 171	4

	UNITS
Environmental Policy Analysis	**23-24**
Preparation: Economics 1A; basic course in political science.	
Environmental Studies 110, 160, 161, 166, 168A	20
Environmental Studies 171 or 179	3-4

Minor Adviser. S. I. Schwartz. *(Environmental Studies.*

Environmental Studies

(Intercollege Division)

Paul A. Sabatier, Ph.D., Chairperson of the Division, and Acting Associate Dean of Environmental Studies

Division Office, 2132 Wickson Hall (752-3026)

Faculty

Francisco J. Ayala, Ph.D., Professor *(Genetics)*
Richard Cowen, Ph.D., Professor *(Geology)*
Paul P. Craig, Ph.D., Professor *(Engineering: Applied Science)*
James C. Cramer, Ph.D., Associate Professor *(Sociology)*
[2 3]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
Alan M. Hastings, Ph.D., Associate Professor *(Mathematics)*
Robert A. Johnston, M.S., Associate Professor
Jere H. Lipps, Ph.D., Professor *(Geology)*
Benjamin S. Orlove, Ph.D., Associate Professor
Thomas M. Powell, Ph.D., Associate Professor
James F. Quinn, Ph.D., Assistant Professor *(Environmental Studies, Zoology)*
Peter J. Richerson, Ph.D., Professor
Paul A. Sabatier, Ph.D., Professor
Thomas W. Schoener, Ph.D., Professor *(Environmental Studies, Zoology)*
Seymour I. Schwartz, Ph.D., Professor
Daniel Sperling, Ph.D., Assistant Professor *(Environmental Studies, Civil Engineering)*
Harry O. Walker, Ed.D., Senior Lecturer *(Land, Air and Water Resources)*
Geoffrey A. Wandesforde-Smith, Ph.D., Associate Professor *(Environmental Studies, Political Science)*
Charles H. Warren, J.D., Adjunct Professor
Kenneth E. F. Watt, Ph.D., LL.D., Professor *(Zoology)*
James E. Wilen, Ph.D., Associate Professor *(Environmental Studies, Agricultural Economics)*

The Program of Study

The intercollege Division of Environmental Studies is a teaching and research unit offering courses, workshops, and directed group study classes that focus on the complex problems of human-environment relations. The Division offers a Bachelor of Science degree in *Environmental Policy Analysis and Planning* (see page 207). Courses in Environmental Studies also supplement major programs in a wide variety of established disciplines, although highly motivated undergraduates who find existing majors unsuited to their educational objectives are encouraged to contact the Chairperson and faculty of the Division regarding individual majors in the College of Letters and Science and the College of Agricultural and Environmental Sciences (see page 234).

Current Information. Through its continuing contacts with many other departments and teaching divisions on the campus, the Division develops each year a variety of special courses and workshops that cannot be listed here.Students are advised to check with the Division Office and with the expanded course description handbook of the College of Agricultural and Environmental Sciences for up-to-date information about courses.

Elective Programs in Environmental Studies. Students from a variety of majors may wish to focus their electives in Environmental Studies. To aid students in identifying coherent groups of courses that build theory and research skills and complement their disciplinary majors, three suggested elective programs appropriate for natural scientists, social scientists, and environmental professionals are listed below. These *example* programs are merely indicative; in order to increase the effectiveness of your program and to get the most out of your elective units, you should consult with appropriate Environmental Studies faculty before taking courses.

Ecological Analysis

This study program is intended for natural science students desiring a focus in ecology and its application in resource analysis. These courses develop theoretical and analytical skills, including laboratory or field work.

Environmental Studies 100 (general ecology)
Environmental Studies 121 (population ecology)
Environmental Studies 122 (analysis of ecological communities)
Zoology 149 (evolution of ecological systems)
Environmental Studies 123 (introduction to field and laboratory methods in ecology), 151L (limnology laboratory), or Zoology 228 (experimental animal ecology)
Subspecializations are as follows:

(a) Behavioral Biology
Environmental Studies 125 (social systems of animals and humans); Psychology 150 (comparative psychology); Anthropology 154A-154B (ecology and sociobiology of primates)

(b) Aquatic Ecology
Environmental Studies 151 (limnology); Environmental Studies/ Geology 116 (the oceans), 150A (physical and chemical oceanography), 150B (geological oceanography), 150C (biological oceanography); Water Science 41 (ecology of polluted waters)

(c) Ecology of Taxa
Botany 117 (plant ecology); Zoology 125 (animal ecology); and others

(d) Simulation and Modeling
Environmental Studies 128 (analysis and simulation of complex systems), Wildlife and Fisheries Biology 122 (dynamics of exploited animal populations)

Environmental Policy Analysis

This program is suitable for both natural science and social science students, as well as professionals such as those in environmental planning and management or engineering who do not wish to take the major in Environmental Policy Analysis and Planning. This set of courses develops theoretical and analytical skills in political, economic, and legal analysis of public policies, plans, and programs that affect the environment. Intermediate microeconomics should be taken before Environmental Studies 168A and Agricultural Economics 176.

Environmental Studies 160 (environmental decision making), Political Science 107 (environmental politics and administration), 108 (policy making in the public sector), or 109 (public policy and the governmental process)
Environmental Studies 166 (case studies in administrative failure and reform), Political Science 181 (the American administrative system), or 182 (administrative decision making and public policy)
Environmental Studies 161 (environmental law), 173 (public mechanisms for controlling land use), or Water Science 150 (water law and water institutions)
Environmental Studies 171 (environmental planning), 179 (environmental impact reporting), or Environmental Studies 110 (principles of environmental science)

NOTE: For key to footnote symbols, see page 123.

Agricultural Economics 147 (natural resource economics), or 176 (economic analysis in resource use)
Environmental Studies 168A (methods of environmental policy evaluation) and 168B (methods of environmental policy analysis)
Environmental Studies 165 (science, experts, and public policy) for natural science and engineering students.

Cultural Ecology

This program is for social science and natural science students interested in the interactions between human populations and their environments and in cross-cultural comparisons. Students seeking future work in rural development, public health, overseas environmental management, and graduate work in human ecology, anthropology, economics, or sociology will find this program useful. Several disciplines are synthesized here.

Environmental Studies 100 (general ecology) or Zoology 125 (animal ecology)
Environmental Studies/Anthropology 101 (principles of human ecology)
Environmental Studies/Anthropology 141 (cultural ecology)
Economics 100 (intermediate micro theory) or Anthropology 122 (economic anthropology)
Environmental Studies 125 (social systems of animals and humans) or Anthropology 154A (ecology and sociobiology of primates)
Environmental Studies 178 (applied research methods)

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

1. Environmental Analysis (4) III. Foin, Schwartz
Lecture—3 hours; discussion—1 hour. Prerequisite: sophomore standing; introductory courses in biology, chemistry, economics, and political science recommended. Analysis of the biological, physical, and social interactions which constitute environmental problems, such as food production, energy development and conservation, pollution, and the conservation of natural environments. Emphasis on analysis of problems and the consequences of proposed solutions. Students who have had course 10 may receive only 3 units of credit for course 1.

10. Introduction to Environmental Studies (4) I, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology recommended. Survey of the importance of ecology and systems behavior for man-environment relationships and management problems. Resources, environmental quality, urban dynamics, environmental perception, and conservation are covered. Includes several integrative case studies, and features individual reading in environmental problems. Not open for credit to those who have had course 1.

20. Energy: Options and Issues (3) I, 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 students should refer to Engineering 160.)

20L. Energy: Options and Issues Laboratory (2) I, Walker
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 20 (may be taken concurrently). On-site study programs and representative types of energy conversion units, includes hydroelectric, geothermal, fossil fuel, and nuclear facilities. Saturday trips primarily.

***25. Environmental Policy** (3) III. The Staff
Lecture—3 hours. Prerequisite: introductory courses in microeconomics, American politics, and ecology recommended. An introduction to the economic and political analysis of environmental policy issues dealing with pollution control, renewable resources, land use, and energy. Focus on California and the U.S., with some attention to international problems.

30. The Global Ecosystem (3) III. Richerson
Lecture—3 hours. Prerequisite: Biological Sciences 1 or Geography 1 or consent of instructor. The course will focus upon how the interaction of climate and biotic adaptation produces ecological systems. It will then examine the limits and opportunities for human use of different natural environments, as well as more general questions of human utilization for the earth's biotic resources.

92. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internship supervised by member of the faculty. (P/NP grading only.)

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

Upper Division Courses

100. General Ecology (4) I, Quinn
Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology (including botanical and zoological elements); elementary calculus. Ecological principles of biological systems, emphasizing populations and ecosystems. Principles of growth, regulation, distribution, structure, energetics, and mineral cycles related to the evolution of biological systems and applications to selected human ecological problems.

101. Principles of Human Ecology (4) II. Davis, Foin
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 or 10; Sociology 1 or Anthropology 2 recommended. An examination of the critical variables in the processes that related man to his environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Anthropology 101.)

108. Philosophy of the Biological Sciences (4) III. Griesemer (Philosophy)
Lecture-discussion—4 hours. Prerequisite: a major in a biological science or one philosophy course. Scientific method in biology. Nature of biological theories, explanations, and models. Problems of evolutionary theory, ecology, and sociobiology. Bio-engineering and environmental ethics. (Same course as Genetics 108 and Philosophy 108).

(a) Environmental Science

110. Principles of Environmental Science (4) I, Powell
Lecture—3 hours; discussion—1 hour. Prerequisite: Physics 1A or 2A, Mathematics 16B or 21B, and Biological Sciences 1. Application of physical and chemical principles, ecological concepts, and systems approach to policy analysis of atmospheric environments, freshwater and marine environments, land use, energy supplies and technology, and other resources.

114A-114B. Integrative Environmental Systems Analysis (5-5) I-II. Watt
Lecture—3 hours; discussion—1 hour; individual or group project—1 hour. Prerequisite: Biological Sciences 1 or Economics 1B; sophomore standing. Explanation of complex environmental problems in terms of scientific principles and systems theory, and provides training in computer modelling of systems performance. (Same course as Zoology 114A-114B.)

115. Bioenvironmental Consequences of Nuclear Technology (3) III. M. Goldman
Lecture—2 hours; discussion—1 hour; field trip to nuclear power station. Prerequisite: consent of instructor; Physics 2A and Biological Sciences 1, or the equivalent. Discussion of biospheric implications of radionuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on the prediction of the response of the most sensitive physiological systems will be emphasized. (Same course as Radiological Sciences 115.)

116. The Oceans (3) II. Ward (Geology)
Lecture—3 hours. Prerequisite: upper division standing or consent of instructor. Introductory survey of the marine environment. Oceanic physical-phenomena, chemical constituents, geological history, and the sea's biota; man's utilization of marine resources. (Same course as Geology 116.)

(b) Ecological Analysis

121. Population Ecology (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 2, Zoology 2-2L, Mathematics 16A-16B. Development of exponential and logistic growth models for plant and animal populations, analysis of age structure and genetic structure, analysis of competition and predator-prey systems. Emphasis is on developing models and using them to make predictions and on solving problems.

122. Analysis of Community Dynamics (4) II. Foin
Lecture—3 hours; discussion—1 hour. Prerequisite: one course in elementary ecology (course 100, Zoology 125, Entomology 104, Botany 117, or the equivalent); elementary statistics and calculus strongly recommended. Course examines the theory of community ecology from an analytical point of view. Topics covered include energy and material flows, community organization homeostasis, and evolution. Emphasis is placed on systems ecology and the impact of man on ecological systems.

123. Introduction to Field and Laboratory Methods in Ecology (4) I, Hamilton
Lecture—2 hours; laboratory—6 hours; two weekend field trips. Prerequisite: Statistics 13, course 100 (may be taken concurrently), or the equivalent. Course will introduce students to methods used for collecting ecological data in field and laboratory situations. Methods used by population ecologists and community ecologists are included and emphasis will be placed on experimental design, scientific writing and data analysis.

124. Marine and Coastal Field Ecology (10) Extra-session summer. Chow
Lecture—6 hours, discussion—4 hours, seminar—1 hour, and laboratory—18 hours (Summer Session II). Prerequisite: Biological Sciences 1; Statistics 13; course 100. Full-time study at Bodega Marine Laboratory. Intensive lecture-laboratory-field study of current ecological theory and problems with emphasis on marine populations and communities; techniques and evaluation of quantitative field research.

125. Social Systems of Animals and Humans (4) III. Hamilton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100 or the equivalent recommended. The nature and interpretation of animal social systems, and their relevance to an understanding of man's social conventions and evolution. Aggression dominance, communication, sexual behavior, cooperation and social regulation of density are considered from an evolutionary perspective.

***126. Introduction to Environmental Health** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Community Health 101 or introductory course in biological science. Problems in environmentally dependent aspects of individual and public health. Diseases associated with pollution of air, water, soil and food: Zoonoses such as malaria, plague, rabies, and hazards of certain occupational environments.

***127. Contemporary Problems in Environmental Health** (3) III. The Staff
Lecture—2 hours; discussion—1 hour. Prerequisite: Environmental Studies or consent of instructor. Contemporary problems and issues in environmentally dependent aspects of health. Diseases and injuries from environmental carcinogens, teratogens, pesticides, noise, radiation, consumer products, stress phenomena, and heavy metals are considered.

128. Analysis and Simulation of Complex Systems (5) I, Foin
Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: Mathematics 16B or 21B, and Statistics 102; upper division standing in the biological or social sciences. Analysis of systems and construction of simulation models of ecological and socioeconomic systems using DYNAMO as the computer language. Logical and scientific reasoning is stressed. Training is applied to term projects.

(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.)

***142. Culture and Environmental Perception** (4) II. The Staff
Lecture—3 hours; individual research project. 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.

(d) Aquatic Ecosystems Analysis

***150A. Physical and Chemical Oceanography** (4) I, Powell
Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies/Geology 116, Physics 8C, Mathematics 22C, Chemistry 1C; or upper division standing in a natural science and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, currents, waves, tides, mixing, major oceanic geo-chemical cycles. (Same course as Geology 150A.)

NOTE: For key to footnote symbols, see page 123.

150B. Geological Oceanography (3) II. Cowen (Geology), Lipps (Geology)
Lecture—3 hours. Prerequisite: Geology 50 or 116. Introduction to the origin and geologic evolution of ocean basins. Composition and structure of oceanic crust; marine volcanism; and deposition of marine sediments. Interpretation of geologic history of the ocean floor in terms of sea-floor spreading theory. (Same course as Geology 150B.)

150C. Biological Oceanography (3) III. Powell, Quinn
Lecture—3 hours. Prerequisite: Biological Sciences 1 and a course in general ecology, or consent of instructor. Survey of the ecology of major marine habitats including intertidal, shelf benthic, deep-sea and plankton communities. Existing knowledge and contemporary issues in research. Portion of course will be devoted to man's use of and impact on the ocean. (Same course as Geology 150C.)

151. Limnology (4) III. C. Goldman
Lecture—3 hours; discussion—1 hour; special project. Prerequisite: Biological Sciences 1 and junior standing. The biology and productivity of inland waters with emphasis on the physical and chemical environment.

151L. Limnology Laboratory (3) III. C. Goldman
Laboratory—6 hours; two weekend field trips. Prerequisite: course 151 (may be taken concurrently); junior, senior, or graduate standing. Limnological studies of lakes, streams, and reservoirs with interpretation of aquatic ecology.

(e) Environmental Policy Analysis

160. Environmental Decision Making (4) I, Sabatier
Lecture—3 hours; discussion—1 hour. Prerequisite: Political Science 1; Economics 1A; introductory statistics; one course in environmental science. Alternative models of environmental policy-making, and application to case studies of decision-making in the U.S. and California.

161. Environmental Law (4) II. Wandesforde-Smith
Lecture—4 hours; discussion—1 hour. Introduction for non-Law School students to some of the principal issues in environmental law and the judicial interpretation of some important environmental statutes, e.g., NEPA.

165. Science, Experts and Public Policy (4) II. Craig
Lecture—4 hours. Prerequisite: upper division standing in the social or biological sciences; course 160 or Political Science 108 recommended. Analysis of factors affecting the influence of scientists, planners, and other experts in policy-making. Several cases and controversies will be examined.

166. Case Studies in Administrative Failure and Reform (4) II. Sabatier
Lecture—3 hours; discussion—1 hour. Prerequisite: course 160 or Political Science 197; Statistics 103 or 108 strongly recommended. Selected cases of alleged failure by administrative agencies dealing with environmental problems. Examines a number of causes and alternative reforms. Emphasizes critical examination of written materials.

167. Energy Policy (4) III. Johnston
Lecture—4 hours. Prerequisite: course 20 or Engineering 160; course 160 or Political Science 101, 107, or 109. Overview of U.S. energy policy: policy analysis, philosophy and methods; major policy issues, such as renewable vs. nonrenewable; and applied studies of power plants, solar residential, and state policy options.

168A. Methods of Environmental Policy Evaluation (4) II. Schwartz
Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 13 (or the equivalent), Economics 1A or Agricultural Economics 147. Examination of issues, concepts and methods applicable to environmental policy evaluation. Topics include analysis of information needs, data availability, and research strategies appropriate for policy evaluation models; benefit-cost analysis, policy impact assessment, multi-objective evaluation, and policy implementation.

168B. Methods of Environmental Policy Analysis (4) III. Schwartz
Lecture—3 hours; discussion—1 hour. Prerequisite: course 168A. Continuation of course 168A, with emphasis on examination of the literature for applications of research and evaluation techniques to problems of transportation, air and water pollution, land use and energy policy. Student will apply the methods and concepts by means of a major project.

169. Economics of Energy (3) II. Wilen
Lecture—3 hours. Prerequisite: Agricultural Economics 100B or Economics 100 or consent of instructor. Course designed to familiarize students with economic concepts necessary to study energy issues. Topics covered include: petroleum economics, cartel behavior, exploration and development, economics of alternative energy sources, risk and uncertainty, transition to alternative sources, substitutability. (Same course as Agricultural Economics 169).

(f) Environmental Planning

171. Environmental Planning (4) II. Sperling
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; a course in social science and a course in environmental science. Laws, institutions, design and analysis methods, and means of implementation of plans for land use, air and water quality, transportation, and energy are examined. Theoretical and practical readings are used. Political and techinical problems common to all planning processes emphasized.

173. Public Mechanisms for Controlling Land Use (4) II. Johnston
Lecture—4 hours. Prerequisite: course 1, English 1, Political Science 1, and Economics 1A. Politics and administration of zoning, subdivision and building regulation and open space preservation, constitutional and legal bases for controls; community and political factors influencing legislation and administration of controls; and the relative effectiveness of specific controls in channeling urban growth.

178. Applied Research Methods (4) I, Sperling
Lecture—4 hours. Prerequisite: Statistics 103 or Sociology 106. Research methods for analysis of urban and regional land use, transportation, and environmental problems. Survey research and other data collection techniques; demographic analysis; basic forecasting, air quality, and transportation models. Collection, interpretation, and critical evaluation of data.

179. Environmental Impact Reporting (3) III. Johnston
Lecture—2 hours; discussion—1 hour. Prerequisite: upper division standing; Biological Sciences 1; one course from the following: course 1, 10, 110, Environmental Toxicology 10, Resource Sciences 100. Methods of analysis used in environmental impact reporting. Emphasis on effective writing, review and management of impact reports in the context of rational democratic planning systems.

(g) Other Courses

190. Workshops on Environmental Problems (1-8) I, II, III. The Staff
Laboratory—2-16 hours. Prerequisite: consent of instructor. Workshops featuring empirical analyses of contemporary environmental problems by multidisciplinary student teams. Guided by faculty and lay professionals, the teams seek to develop an integrated view of a problem and outline a series of alternative solutions. Open to all upper division and graduate students on application. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Directed study of a topic selected by the student and the instructor. (P/NP grading only.)

Graduate Courses

212A. Environmental Policy Analysis (4) III. Sabatier
Lecture—3 hours; discussion—1 hour, seminar paper. Prerequisite: course in public policy (e.g. Political Science 107 or 108), course in bureaucratic policy making (e.g. course 166 or Political Science 181) and course in intermediate statistics (e.g. Sociology 106 or Agricultural Economics 106). An examination of selected topics in the formulation and implementation of environmental policy, with a principal emphasis on conceptual and methodological issues. Offered in odd-numbered years. (Same course as Ecology 212A.)

212B. Environmental Policy Analysis: Evaluation (4) I, Schwartz
Lecture—1 hour; discussion—1 hour, seminar—2 hours; independent evaluation project. Prerequisite: Economics 100 (or the equivalent), course 168A (or the equivalent course in policy analysis or resource economics), intermediate level statistics (e.g. Sociology 106 or Agricultural Economics 106). Examination of recent research and practice in the evaluation of environmentally related policies, programs, and plans. Ex ante and ex post evaluation will be studied. Offered in odd-numbered years (Same course as Ecology 212B.)

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

Environmental Toxicology

(College of Agricultural and Environmental Sciences)

Dennis P. H. Hsieh, Sc.D., Chairperson of the Department

Department Office, 109 Environmental Toxicology (752-1142)

Faculty

Thomas E. Archer, B.A., Adjunct Lecturer
Richard G. Burau, Ph.D., Professor
James L. Byard, Ph.D., Associate Professor
Donald G. Crosby, Ph.D., Professor
Bruce D. Hammock, Ph.D., Professor
Gary L. Henderson, Ph.D., Associate Professor
Dennis P. H. Hsieh, Sc.D., Professor
Wendell W. Kilgore, Ph.D., Professor
James B. Knaak, Ph.D., Visiting Lecturer
Ming-yu Li, Ph.D., Adjunct Lecturer
James N. Seiber, Ph.D., Professor
Takayuki Shibamoto, Ph.D., Associate Professor
Lee R. Shull, Ph.D., Assistant Professor
Norman Wade, M.S., Visiting Lecturer
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 and methodology of the physical and biological sciences to the study of toxicants as a basis for solving problems occasioned by the presence of toxicants in the environment. Through the appropriate choice of electives, students have the opportunity to specialize in any one of several areas of environmental toxicology. Students electing to emphasize the application of the physical sciences to the study of toxicants would qualify for positions in residue analysis, environmental monitoring and forensic toxicology. Those electing to emphasize the application of the biological sciences to the study of toxicants would qualify for positions in animal toxicology, environmental health and safety, and pest control. The major can also serve as preparation for graduate or professional school.

Environmental Toxicology

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses will be accepted. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**58-63**
Biological sciences (Biological Sciences 1)	5
Other biological sciences (entomology, zoology, botany, bacteriology, physiology)	10-12
General chemistry (Chemistry 1A-1B-1C)	15
Organic chemistry (Chemistry 8A-8B or 128A-128B)	6
Environmental science (Environmental Toxicology 10 or Environmental Studies 10)	3-4
Mathematics (Computer Science Engineering 20, Mathematics 16A-16B or 21A-21B, Statistics 13)	13-15
Physics (Physics 1A-1B or 2A-2B)	6
Depth Subject Matter	**56**
Biochemistry (Biochemistry 101A, 101B)	6

NOTE: For key to footnote symbols, see page 123.

Organic chemistry (Chemistry 128A, 128B or 128C) 3
Environmental Toxicology 101, 112A, 112B, 114A, 114B, 138 (128, 130A-E, 131, 132) 23
Electives selected for area of specialization with adviser's approval 24

Breadth Subject Matter 50
English and/or rhetoric (See College requirements) 8
Social sciences and humanities electives† 12
Electives selected with adviser's approval to complement program options: courses in agricultural economics, environmental studies, sociology, political science, and psychology are particularly recommended 30

Unrestricted Electives 11-16
Total Units for the Major 180

Major Adviser. T. Shibamoto.

Advising Center for the major, is in 109 Environmental Toxicology Building.

Minor Program Requirements:

UNITS

Environmental Toxicology 18
Environmental Toxicology 101, 112A, 114A, 138 ... 12
Elective courses 6 units minimum, selected from Environmental Toxicology 198 and 199 (4 units combined maximum), 10, 130A-E, 131, 132, 190 6

Minor Adviser. L.R. Shull.

Related Courses. See Resource Sciences 131, Environmental Studies 10, 121.

Graduate Study. Programs of study leading to M.S. and Ph.D. degrees are available in the area of environmental toxicology (see page 94). For information on graduate study contact the graduate adviser.

Graduate Adviser. W. W. Kilgore.

Courses in Environmental Toxicology

Lower Division Courses

10. Introduction to Toxicology (3) III. Kilgore
Lecture—3 hours. Prerequisite: open to science and nonscience majors. Study of some natural and man-made toxic substances in personal, occupational, community and global environments. Emphasis placed upon occurrence, properties and effects of toxic substances. Biological and physical factors which alter fate of substances are described.

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Principles of Environmental Toxicology (3) I, Shull
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 environmental fates and their health significance.

112A. Toxicants in the Environment (3) II. Crosby, Seiber
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, Shibamoto
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 112A and consent of instructor. Continuation of 112A. Toxic chemicals—primarily pollutants—in the environment; concepts of techniques of sampling, detecting, and measuring toxicants of current concern; collection, interpretation, and use of analytical data. Limited enrollment. Environmental Toxicology majors will be given preference for enrollment.

114A. Biological Effects of Toxicants (3) II. Byard
Lecture—3 hours. Prerequisite: Biochemistry 101B (may be taken concurrently); course 101 and Physiology 110 recommended. Course designed to illustrate the biological effects of toxic substances in living organisms. Topics to be covered: fate and mechanism-of-action of representative toxicants, types of effects, symptoms, and antidotes.

114B. Biological Effects of Toxicants: Comparative Aspects (4) III. Henderson, Byard, Kilgore
Lecture—1 hour; discussion—2 hours; laboratory—3 hours. Prerequisite: course 114A and consent of instructor. Course designed to illustrate basic principles of toxicology and to acquaint students with laboratory techniques for evaluating potential toxicity of chemicals. Continuation of course 114A. Limited enrollment. Environmental Toxicology majors will be given preference for enrollment.

128. Food Toxicology (3) I, Shibamoto, Gruenwedel (Food Science and Technology)
Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B. Chemistry and biochemistry of toxins occurring in foods, including plant and animal toxins, intentional and unintentional food additives. The assessment of food safety and toxic hazards. (Same course as Food Science and Technology 128.)

130A-E. Selected Topics in Environmental Toxicology (3) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—3 hours. Prerequisite: consent of instructor; course 101 recommended. Selected topics of current interest in environmental toxicology. Topics will vary each time the course is offered, and will emphasize such areas as the microbiology of toxic substances, poisonous plants and animals, chemical ecology, toxic substances in foods, and the safe handling of toxic substances.

131. Air Pollutants and Inhalation Toxicology (3) III. Hsieh, Last (Internal Medicine)
Lecture—3 hours. Prerequisite: Chemistry 8B (may be taken concurrently) or the equivalent; course 101, Biochemistry 101A recommended. Toxicology of air pollutants in the ambient and occupational environments. Environmental fates, biological effects, air-quality criteria and standards, and pulmonary responses to these pollutants. Offered in even-numbered years Spring Quarter.

132. Chromatography for Analytical Toxicology (4) II. Archer
Discussion—1 hour; laboratory—8 hours; slide demonstrations and extensive library assignments. Prerequisite: Chemistry 8B or the equivalent (may be taken concurrently); consent of instructor. Application and theory of basic chromatographic techniques such as thin-layer, gas-liquid, high-pressure liquid and column chromatography useful for analytical toxicology; residue analysis comprises one third of course.

138. Legal Aspects of Environmental Toxicology (3) I, Li
Lecture—3 hours. Prerequisite: consent of instructor; courses 10 and 101 recommended. Federal and California legislation concerning air and water pollution, pesticide use, food and feed additives, consumer protection, and occupational exposure to toxic substances; roles of Federal regulatory agencies; alternatives to governmental control.

190. Seminar (1) I. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: consent of instructor. Selected topics presented by students, faculty, or outside speakers covering current research and instructional activities within environmental toxicology. Reports and discussion concerning oral and written presentations, literature sources and career opportunities. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the College of Agricultural and Environmental Sciences. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Environmental Toxicology (1-5) I, II, III. The Staff (Chairperson in charge)
Hours and duties will vary depending upon course being tutored. Prerequisite: advanced standing in Environmental Toxicology, a related major, or the equivalent experience and consent of instructor. Teaching toxicology including conducting discussion groups for regular departmental courses under direct guidance of staff. May be repeated for credit up to a total of 5 units. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Mammalian Toxicology (4) II. Shull
Lecture—3 hours; discussion—1 hour (alternate weeks); laboratory—4 hours (alternate weeks). Prerequisite: course 114A, and consent of instructor. Fate, mechanism of action and symptomatology of toxicants in mammals. Limited enrollment; preference given to students in Pharmacology and Toxicology and Environmental Pathology.

203. Environmental Toxicants (4) II. Crosby
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 128C (or the equivalent), or Chemistry 8B and consent of instructor. Toxic chemicals: selected topics illustrating their occurrence, structure, and the reactions underlying detection, toxicity, fate, and ecological importance. Offered in odd-numbered years.

214. Mechanisms of Toxic Action (3) III. Hammock
Lecture—3 hours. Prerequisite: Biochemistry 101A-101B and consent of instructor. Biochemical and physiological mechanisms underlying toxicity and detoxification.

220. Analysis of Toxicants (3) I, Seiber
Lecture—3 hours. Prerequisite: course 101 and consent of instructor; course 203 recommended. Principles of the microanalysis of toxicants. Theoretical considerations regarding separation, detection, and quantitative determination of toxicants using chemical and instrumental techniques.

220L. Analysis of Toxicants Laboratory (2) I, Seiber
Laboratory—6 hours. Prerequisite: course 220 (may be taken concurrently) and consent of instructor. Laboratory techniques for microanalysis of toxicants. Separation, detection, and quantitative determination of toxicants using chemical and instrumental methods.

234. Neurophysiological Basis of Neurotoxicology (3) I, Woolley
Lecture—24 hours; discussion—4 hour. Prerequisite: Physiology 110 (or the equivalent) and basic understanding of neurophysiology; consent of instructor. Mechanisms of action of a number of different neurotoxins, including marine toxins, insecticides and heavy metals. Examples of ways toxins may act on the nervous system and techniques for study of neurotoxicology. Offered in odd-numbered years. (Same course as Physiology 234.)

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Current topics in environmental toxicology. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—1 hour. Prerequisite: consent of instructor. Presentation and critical discussion of advanced research methods and interpretation of research results. Designed primarily for graduate students. (S/U grading only.)

297T. Tutoring in Environmental Toxicology (1-5) I, II, III. The Staff (Chairperson in charge)
Hours and duties will vary depending upon course being tutored. Prerequisite: advanced standing in Environmental Toxicology, a related major, or the equivalent experience, and consent of instructor. Teaching toxicology including conducting discussion groups for regular departmental courses under direct guidance of staff. May be repeated for credit up to a total of 5 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson 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 (Chairperson in charge)
(S/U grading only.)

Epidemiology and Preventive Medicine

(School of Veterinary Medicine)

Hans P. Riemann, D.V.M., Ph.D., Chairperson of the Department

Department Office, 112 Surge-IV

Faculty

Raymond A. Bankowski, D.V.M., Ph.D., Professor Emeritus
Robert B. Bushnell, D.V.M., Adjunct Lecturer
Tim E. Carpenter, Ph.D., Assistant Professor
Thomas B. Farver, Ph.D., Associate Professor
Constantin Genigeorgis, D.V.M., Ph.D., Professor
William Goodger, D.V.M., M.P.V.M., Ph.D., Assistant Professor

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 123.

David W. Hird, D.V.M., Ph.D., Assistant Professor
Jack A. Howarth, D.V.M. Ph.D., Professor Emeritus
Winifred E. Kistler, M.L.S., Adjunct Lecturer
Kenneth M. Lam, Ph.D., Assistant Professor
Laurel Lasslo, Ph.D., Visitng Lecturer
Michel M.J. Lavoipierre, M.B., Ch.B., Professor
R. H. McCapes, D.V.M., Senior Lecturer
Marjan Merala, M.S., Ldo. Vet., Adjunct Lecturer
Margaret E. Meyer, Ph.D., Professor
Ben B. Norman, D.V.M., Ph.D., Adjunct Lecturer
William A. Priester, D.V.M., M.P.H., Adjunct Professor
Hans P. Riemann, D.V.M., Ph.D., Professor
Walter W. Sadler, D.V.M., M.P.H., Professor Emeritus
Robert Schneider, D.V.M., M.S., Associate Adjunct Professor
Calvin W. Schwabe, D.V.M., M.P.H., Sc.D., Professor
Patton L. Smith, D.V.M., M.P.V.M., Visiting Lecturer
George B. E. West, D.V.M., M.P.V.M., Visiting Lecturer
Richard Yamamoto, Ph.D., Professor
George K. York, Ph.D., Adjunct Lecturer

Part-Time Clinical Faculty

Galestan Ghazikhanian, D.V.M., Ph.D., Associate Clinical Professor
Richard A. McMillan, D.V.M., P.V.M., Assistant Clinical Professor

Courses in Epidemiology and Preventive Medicine

Upper Division Courses

104. History of Veterinary Medicine (3) III. Schwabe
Lecture—2 hours; discussion—1 hour. Veterinary medicine's role (from man's first domestication of animals to the decline of Rome) in building a foundation for rational healing; and its contributions during the eighteenth-twentieth centuries to the creation of modern medicine.

111. Animal Hygiene (3) II. 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.

112. Animal Health Management (3) III.
Lecture—3 hours. Prérequisite: Biological Sciences 1; course 111 and at least one course in animal science are highly recommended. The basis, design, implementation, and monitoring of animal health management programs to maximize production and minimize disease losses in livestock enterprises.

150. Food-borne Infections and Intoxications (4) II. Genigeorgis, York, Riemann
Lecture—4 hours. Prerequisite: Bacteriology 2. Prevalence and characteristics of those diseases of man which are derived from food or food sources; access of disease agents to and distribution in food and food sources; exposure of man to these agents; prevention of food-borne diseases.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

202. Sampling in Health Related Research (3) I, Farver
Lecture—3 hours. Prerequisite: course 403 or the equivalent; consent of instructor. Thorough coverage of simple random sampling, stratified sampling, cluster sampling and systematic sampling. Emphasis is on applied sampling techniques but includes measurement and survey execution. Offered in even-numbered years.

203. Selected Topics in Medical Statistics (3) I, Farver
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 404 or the equivalent; consent of instructor. Selected topics in medical statistics as applied to the design and data analysis used in epidemiological research. Possible topics (chosen to suit interests and needs of each class) include: regression analysis; cross-categorical techniques, lifetables; survivorship functions. Offered in odd-numbered years.

212. Epidemiology of the Zoonoses (3) II. Lavoipierre
Lecture—1 hour; discussion—2 hours. Prerequisite: course 405 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. Immunodiagnostic Techniques (3) II. Yamamoto, Lam
Lecture—3 hours. Prerequisite: enrollment in MPVM degree program or consent of instructor. Consideration of immunodiagnostic techniques for screening of animal populations for disease. Emphasis on rapid, simple and inexpensive procedures for mass screening.

216L. Immunodiagnostic Techniques Laboratory (2) II. Yamamoto, Lam
Discussion—1 hour; laboratory—2 hours. Prerequisite: course 216 (may be taken concurrently) or consent of instructor. Application and interpretation of serologic techniques for diagnosis of animal diseases. (S/U grading only.) Limited enrollment.

217. Evaluation of Screening Tests (1) III. Yamamoto
Discussion—2 hours (alternate weeks). Prerequisite: consent of instructor. Evaluation of screening tests (biochemical, serological or hematological) in the context of the population in which the test is performed to demonstrate how changes in various population parameters will influence test efficiency. Offered in odd-numbered years.

219. Mycoplasma as Agents of Disease (2) III. Yamamoto, Lam
Lecture—2 hours. Prerequisite: Veterinary Microbiology 127 or the equivalent or consent of instructor. Mid-term and final examination. Offered in even-numbered years.

220. Advanced Avian Medicine (3) III. Yamamoto, Lam
Lecture—3 hours. Instruction on the methods of prevention of the major diseases of domestic poultry.

221. Epidemiological Approaches Used in Chronic Disease Studies (3) III. Schneider
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 404, 407, or consent of instructor. Emphasis on approaches to chronic disease understanding and prevention in animals. Discussions on disease registries, incidence rates, prospective and retrospective study designs, surveys and interview schedules. Comparative aspects of select chronic disease experience in various animal species and man.

222. Epidemiological Modeling (2) III. Carpenter
Lecture—1 hour; discussion—2 hours. Prerequisite: courses 403 and 406 (may be taken concurrently). Techniques of model-building and simulation of infectious diseases will be explored. Epidemiological modeling philosophy, construction and validation will be emphasized.

225. Preventive Avian Medical Practice (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: enrollment in avian medicine option of MPVM program, third- or fourth-year standing in School of Veterinary Medicine, or consent of instructor. Discussion of the economic structure of the broiler, commercial egg and turkey industries and the delivery of preventive veterinary medical services within these industries. Specific prevention and eradication programs pertaining to diseases of economic importance are covered.

240. Veterinary Medicine and Human Health (3) III. Schwabe
Lecture—2 hours; discussion—1 hour. Prerequisite: professional veterinary or graduate standing or consent of instructor. Fulfillment of veterinary medicine's historic and newer roles as a human health profession; emphases on zoonoses prevention, comparative medical research, monitoring environmental hazards, organized efforts to promote humane values and mental health.

242. Veterinary Medicine and the World Food-Population Problem (3) II. Schwabe
Lecture—2 hours; discussion—1 hour. Prerequisite: professional veterinary or graduate standing or consent of instructor. Survey of the world food–population problem, emphasizing effects of animal diseases and their control upon production of foods of animal and plant origin; comparisons of important Third World and other situations; discussion of current and future prospects.

254. Public Health Aspects of Meat and Meat Products Technology (3) III. Genigeorgis
Lecture—3 hours. Prerequisite: consent of instructor. Study of the influence of techniques and procedures for processing meats and meat products upon their wholesomeness as food.

255. Animal Health Economics (3) II. Carpenter
Lecture—3 hours. Prerequisite: consent of instructor. Basic concepts of microeconomics (production and cost functions, firm decision making, and the market place) as they relate to animal heath are considered. Application of economic decision making techniques which may be used in veterinary medicine are also presented.

***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) I, II, III. Lam, Yamamoto
Seminar—1 hour. Prerequisite: consent of instructor. Topics from the current literature in avian medicine will be assigned to students for discussion and interpretation.

291. Seminars in Epidemiology (1) III.
Seminar—1 hour. Participants will present and discuss ongoing or published research projects in epidemiology. Emphasis will be on study design and data analysis. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Professional Courses

400. Orientation to Statistics (4) I, Farver
Lecture—40 hours. Prerequisite: enrollment in MPVM degree program. Introduction and overview to the concepts basic to biostatistics and epidemiology. (S/U grading only.)

401. Biomedical Information Resources and Retrieval (3) I, Kistler, Merala
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: consent of instructor. Use of bibliographic tools for retrieval of biomedical literature; sources of epidemiological and statistical data; computerized retrieval of information; preparation of bibliographies.

402. Medical Statistics I (3) I, Farver
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 400 or Statistics 13 (or the equivalent); consent of instructor. Use of statistics in clinical, laboratory, and population medicine; graphical and tabular presentation; probability; binomial, normal, t-, F-, and Chi-square distributions; elementary nonparametric methods; introductory methods in regression and correlation; lifetables.

403. Medical Statistics II (3) II. Farver
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 402 or consent of instructor. Continuation of course 402. Analysis of variance in biomedical sciences; nonparametric methods; problems in sampling and surveys; time dependent variation and trends; biomedical applications of statistical methods.

404. Medical Statistics III (3) III. Farver
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 403 or consent of instructor. Continuation of course 403. Multiple regression; discriminant analysis; analysis of covariance; analysis of multiway frequency tables; biomedical applications.

405. Principles of Epidemiology (5) I, Hird
Lecture—2 hours; discussion—2 hours; laboratory—2 hours. Prerequisite: course 400 or the equivalent; a degree in veterinary medicine, medicine or dentistry, or consent of instructor.† Combination of lectures, class discussions, and problem solving. Topics are: methods of investigating disease outbreaks, quantitating disease in populations, medical ecology survey methods, an introduction to epidemiologic study design and animal disease surveillance.

406. Epidemiologic Study Design (3) II. Hird
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 403 (may be taken concurrently) and 405, or consent of instructor.† Design and interpretation of cross-sectional, case-control, and cohort studies (including controlled clinical trials), with examples pertinent to veterinary medicine. Critical review of published epidemiologic studies. Principles of association and causality.

407. Analytical Epidemiology (3) III. Farver
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 406 and 404 (may be taken concurrently). Uses of multiple regression, discriminant analysis, factor analysis, path analysis and other multivariate techniques in epidemiology. Approaches for handling the analysis of large data sets.

408. Research Methodology and Research Reports (3) I, Meyer
Lecture—1 hour; discussion—2 hours. Prerequisites: enrolled in MPVM degree program or consent of instructor.† Application of the experimental method to solving specific epidemiological field problems involving disease of animals. Students must identify and select a problem, and complete all work preparatory to the actual field collection of data or specimens.

409A-409B. Topics in Data Analysis (2-2) II-III. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 406 (may be taken concurrently)† or consent of instructor. Emphasis on decision making with respect to the type and amount of data required for solving epidemiological problems and the selection and use of appropriate data in statistics and economics for processing, analyzing and interpreting these data. (Deferred grading only, pending completion of course.)

NOTE: For key to footnote symbols, see page 123.

410A-410B. Topics in Applied Epidemiology (3-3) II-III. The Staff (Chairperson in charge)
Discussion—3 hours. Prerequisite: course 406 (may be taken concurrently)† or consent of instructor. Collection of data and/or specimens from field studies, serum banks or data banks. Laboratory examination of specimens and recording of results. Alternative approaches to presentation of data and conclusions and formulations of recommendation for further investigations. (Deferred grading only, pending completion of course.)

411. Disease Control and Eradication (3) III. Riemann, Carpenter
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 404 and 407 (may be taken concurently).† Studies of various approaches to control or eradicate disease in animal populations. Design and economic analysis of control programs.

Family Practice

See Medicine

Fermentation Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Fermentation Science major is a program of study of the fundamental and applied sciences related to the use of microorganisms as production and processing agents. A broad interdisciplinary food-related education is offered which may be combined with specializations in *enology* (wine studies), *brewing science*, and *fermentation* of other foods and beverages. Industrial fermentations such as those used in the production of microbial cells, drugs, enzymes, solvents, acids, and vitamins, in the expansion of the food supply, and preservation of the environment, are further opportunities for study. Courses are selected in consultation with advisers. Graduates qualify for supervisory, technical, research, sales or executive positions in the food, beverage, and allied industries, in the fermentation industries, and in governmental agencies.

The major can provide preparation for graduate study in food science, microbiology, agricultural chemistry or biochemistry.

It may be necessary to limit enrollment in this major.

Fermentation Science

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirement are shown in parentheses where possible. Equivalent or more comprehensive courses will be accepted.)

	UNITS
Preparatory Subject Matter	**71**
Biochemistry (Biochemistry 101A, 101B)	6
Biology (Biological Sciences 1)	5
Chemistry (Chemistry 1A, 1B, 1C, 5, 8A, 8B)	25
Mathematics (Mathematics 16A, 16B)	6
Statistics including analysis of variance (Agricultural Science and Management 150 or Statistics 106)	4
Microbiology (Bacteriology 2, 3)	4
Physics (Physics 2A-2B-2C plus one unit of laboratory, e.g., Physics 3A)	10
Computer science (Computer Science Engineering 20 or Engineering 5)	3
Written or oral expression (see College requirement)	8
Depth Subject Matter	**38**
Choose from: Viticulture and Enology 3, 123, 124, 125, 126, 135, 140, 217, 219, 235; Food Science and Technology 102, 102L, 104, 104L, 108, 110A, 110B, 111, 150, 150L, 205, 206, 235, 250, 251; Biochemistry 101L, 123, 123L; Bacteriology 105, 106, 130A-130B, 130L, 250; Environmental Toxicology 138; Epidemiology and Preventive Medicine 150; Chemistry 107A, 107B, 130; Botany 114.	
Restricted Electives	**28**
Selected according to student's educational goalS and upon approval of adviser. (A related series of primarily upper division courses intended.)	
Breadth Subject Matter	**24**
Social sciences and humanities or others as approved by adviser.†	
Unrestricted Electives	**19**
Total Units for the Major	**180**

Major Adviser. A.C. Noble *(Viticulture and Enology).*

Graduate Study. See page 94 and the *Graduate Announcement.*

Food Biochemistry

(College of Agricultural and Environmental Sciences)

The Major Program

The major in Food Biochemistry stresses the principles of chemistry and biochemistry as related to the constituents of foods and the changes which occur in the constituents before and during storage and on processing. Particular emphasis is placed on the role of and changes in the carbohydrates, lipids, proteins, enzymes, and nucleic acids and their effect on the quality attributes of foods. Through the appropriate choice of both electives and in-depth courses in food science and technology, the major offers broad education to students planning careers in food processing, food research, and other food-related fields.

The major also offers excellent preparation for graduate work in agricultural chemistry, biochemistry, nutrition, medicine, and the life sciences.

Food Biochemistry

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**77-82**
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 Computer Science Engineering 8, 20, Engineering 5, Mathematics, 22A, 22B, 22C, Statistics 13	12
Bacteriology 2 or 102, and 3	4-5
Physics, any course except Physics 10 and including at least one laboratory course (Physics 2A-2B-2C or 3A or 3B or 3C)	10
English (see College requirement)	8
Depth Subject Matter	**30**
Food Science and Technology, including 103, 104, 104L, 110A or 111,	25
Biochemistry 123, 123L	5
Breadth Subject Matter	**22**
Social sciences and humanities, including 4 units of rhetoric†	22
Restricted Electives	**26**
At least one upper division biochemistry, course, other than Biochemistry 101A, 101B, 101L, and one nutrition course of at least 3 units. The remaninig units can be selected from biochemistry, physiology, environmental toxicology, genetics, public health, bacteriology, or other subjects related to Food Science	26
Unrestricted Electives	**20-25**
Total Units for the Major	**180**

Major Adviser. M. Mazelis *(Food Science and Technology).*

Graduate Study. See page 94.

Food Science

(College of Agricultural and Environmental Sciences)

The Major Program

Food Science applies physical, biological, engineering, and social sciences to processing, preservation, packaging, storage, evaluation and utilization of foods. Instruction emphasizes the principles of biology, chemistry, microbiology, and other sciences as they are applied to the conversion of raw materials into processed foods. General principles are stressed, not specific food commodities.

Students completing this major receive excellent training and experience for employment in the world's largest industry, the food industry. Opportunities for employment include positions in the food and allied industries where graduates can engage in processing, sensory evaluation, quality assurance, product development, research, and management functions; in education as teachers; and in research, extension, and administration. Local, state and federal governments offer opportunities for employment as research supervisors, in regulatory agencies, in policy and management positions. Graduate study for the Food Science student may lead to the M.S. degree in Food Science or the Ph.D. degree in related fields such as agricultural chemistry, biochemistry, microbiology and nutrition.

Food Science

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

	UNITS
Preparatory Subject Matter	**62-67**
Biology and microbiology (Biological Sciences 1, Bacteriology 2, 3)	9
Chemistry and biochemistry, including analytical chemistry (Chemistry 1A-1B-1C-5 or 4A-4B-4C, 8A-8B; Biochemistry 101A-101B)	27-31
Mathematics and physics, including two courses in calculus (Agricultural Science and Management 150 or Statistics 13; Mathematics 16A-16B; Physics 2A-2B- 2C)	18-19
Written or oral expression (see College requirement)	8

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

†Units earned in satisfaction of the American History and Institutions requirements may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 123.

Depth Subject Matter **28**
Upper division courses in Food Science and Technology, including 100A-100B, 103, 104, 104L, 110A-110B, 190 28

Breadth Subject Matter **28**
Social sciences and humanities electives† 28

Restricted Electives **32-37**
Nutrition 112 and other courses selected in accordance with student's educational goal and upon approval of adviser.

Unrestricted Electives **25**
Total Units for the Major **180**

Major Adviser. E. B. Collins *(Food Science and Technology).*

Graduate Study. A program of study and research leading to the M.S. degree in Food Science is available (see below). For further information on graduate study see page 94 and the *Graduate Announcement.*

Food Science (A Graduate Group)

Dieter W. Gruenwedel, Ph.D., Chairperson of the Group

Group Office, 1480 Chemistry Annex, (752-1415)

Faculty. Includes members from eleven departments in the Colleges of Agricultural and Environmental Sciences and Engineering, and the School of Medicine.

Graduate Study. The interdepartmental Graduate Group in Food Science offers programs of study leading to the M.S. degree under both Plan I (thesis) and Plan II (comprehensive oral examination). Detailed information regarding graduate study is available through the Group Chairperson or by obtaining the *Graduate Announcement.*

Graduate Advisers. Contact the Graduate Division for the list of advisers.

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

Everett Bandman, Ph.D., Assistant Professor
Ericka L. Barrett, Ph.D., Associate Professor
Richard A. Bernhard, Ph.D., Professor
A. Wade Brant, Ph.D., Adjunct Lecturer
John Bruhn, Ph.D., Adjunct Lecturer
Edwin B. Collins, Ph.D., Professor
Walter L. Dunkley, Ph.D., Professor
Robert E. Feeney, Ph.D., Professor Emeritus
Dieter W. Gruenwedel, Ph.D., Professor
Jerald M. Henderson, D.Engr., Professor *(Food Science and Technology, Mechanical Engineering)*
Eugene L. Jack, Ph.D., Professor Emeritus
Walter G. Jennings, Ph.D., Professor
Michael J. Lewis, Ph.D., Professor
Bor S. Luh, Ph.D., Lecturer
George L. Marsh, M.S., Professor Emeritus
Mendel Mazelis, Ph.D., Professor
R. Larry Merson, Ph.D., Professor *(Food Science and Technology, Agricultural Engineering)*
Martin W. Miller, Ph.D., Professor
Emil M. Mrak, Ph.D., Professor Emeritus
David M. Ogrydziak, Ph.D., Associate Professor
Michael A. O'Mahony, Ph.D., Associate Professor
Rose Marie Pangborn, M.S., Professor
Hugo Patiño, Ph.D., Assistant Professor
Herman J. Phaff, Ph.D., Professor Emeritus
Chester W. Price, Ph.D., Assistant Professor
Robert J. Price, Ph.D., Adjunct Lecturer
David S. Reid, Ph.D., Associate Professor
Thomas Richardson, Ph.D., Professor *(Peter J. Shields Professor in Dairy Food Science)*
Gerald F. Russell, Ph.D., Associate Professor
Barbara O. Schneeman, Ph.D., Associate Professor *(Food Science and Technology, Nutrition)*
Bernard S. Schweigert, Ph.D., Professor
C.F. Shoemaker, Ph.D., Assistant Professor
R. Paul Singh, Ph.D., Professor *(Food Science and Technology, Agricultural Engineering)*
Gary M. Smith, Ph.D., Assistant Professor
Lloyd M. Smith, Ph.D., Professor
Clarence Sterling, Ph.D., Professor Emeritus
Aloys L. Tappel, Ph.D., Professor
Reese H. Vaughn, Ph.D., Professor Emeritus
John R. Whitaker, Ph.D., Professor *(Food Science and Technology, Biochemistry and Biophysics)*

Major Program and Graduate Study. See the major in Food Science (this page); and page 94 for graduate study.

Related Courses. See courses in Biochemistry and Biophysics, Consumer Science, Nutrition, and Viticulture and Enology; Environmental Toxicology 101, Epidemiology and Preventive Medicine 150, Plant Science 112, and 112L.

Courses in Food Science and Technology

Lower Division Courses

1. Food Science and Society (3) I, III. Jennings, Bernhard, Schweigert
Lecture—2 hours; discussion—1 hour. Nature and scope of world food problem; food composition; scientific and technological aspects of converting animal and plant products into a variety of prepared foods; improvement and evaluation of acceptability and nutritional value of foods. Not open for credit to students who have received credit for course 100A, 100B, or 111.

20. Food and Culture: An Introduction to Culture, Diet, and Cuisine (4) III. Grivetti (Nutrition, Geography)
Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2, Geography 2 and Nutrition 10 recommended. Historical and contemporary overview of culture, food habits, and diet; exploration of the major themes in food habit research; minority food habits, origins and development of dietary practices. (Same course as Nutrition 20.)

49. Processing Plant Studies (1) III. Luh
Discussion—1 hour; field trips—3 hours. 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. Ferrell (Nutrition), Schweigert
Seminar—1 hour. Faculty and invited guest speakers will present topics in the area of nutrition and food science which are currently subjects of public debate. Intended as an introduction to nutrition and food science for students new to the campus. (P/NP grading only.) (Same course as Nutrition 93.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Schweigert in charge)
(P/NP grading only.)

Upper Division Courses

100A. Principles of Food Composition and Properties (3) I, Russell
Lecture—3 hours. Prerequisite: Chemistry 8A and 8B. Fundamental chemical, physical, and sensory aspects of food composition as they relate to physical properties, acceptability, and nutritional value of fresh and processed foods.

100B. Principles of Food Composition and Properties (3) II. Mazelis
Lecture—3 hours. Prerequisite: Chemistry 8A-8B. Fundamental chemical, physical, and sensory aspects of food composition as they relate to physical properties, acceptability, and nutritional value of fresh and processed foods.

101A. Principles of Food Composition and Properties Laboratory (2) I, Shoemaker
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100A (may be taken concurrently). Course designed to give laboratory experience with the food systems and properties described in course 100A.

101B. Principles of Food Composition and Properties Laboratory (2) II. Shoemaker
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100B (may be taken concurrently). Course designed to give laboratory experience with the food systems and properties described in course 100B.

102. Malting and Brewing Technology (3) I, Lewis
Lecture—3 hours; optional field trip. Prerequisite: Biochemistry 101A. Technology of the malting, brewing and fermentation processes is integrated with the chemistry, biochemistry, and microbiology that determine industrial practices and product 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, Bernhard, Tappel, G. Smith
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 (3) II, III. Barrett
Lecure—1 hour; laboratory—6 hours. Prerequisite: Bacteriology 2 and 3; course 104 (may be taken concurrently). Cultural and morphological characteristics of microorganisms involved in food spoilage, in food-borne disease, and food fermentation. Analysis of microbiological quality of foods.

107. Principles of Sensory Analysis of Foods (4) II. Pangborn
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Agricultural Science and Management 150 or the equivalent course in statistics. Nature of sensory responses with emphasis on aroma, taste, and texture of foods; critical use of analytical laboratory methods; relation of sensory data to chemical and instrumental measurements; collection and statistical analysis and interpretation of sensory data.

108. Food Processing Plant Sanitation (3) II. 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.

109. Principles of Quality Assurance in Food Processing (2) III. Patiño
Lecture—1 hour; discussion—1 hour. Prerequisite: one course each in food microbiology, food processing, food chemistry, and sensory evaluation. General principles underlying Quality Assurance with examples of application to selected processed food products. Rationale for establishing valid quality assurance programs including selection of samples at critical points. Statistical problems in quality assurance programs. Review of typical quality assurance programs used by the food industry.

110A. Physical Principles in Food Processing (3) I, Merson
Lecture—2 hours; laboratory—2 hours. Prerequisite: Physics 2A and 2B or the equivalent; calculus recommended. Not open for credit to students enrolled in College of Engineering. Applications of the conservation of mass and energy to food processing. Elements of engineering thermodynamics, fluid mechanics, and problem solving.

110B. Heat and Mass Transfer in Food Processing (3) II. Singh
Lecture—2 hours; laboratory—2 hours. Prerequisite: course 110A or the equivalent. Rate processes; conduction, convection, and radiation heat transfer; refrigeration principles; psychrometrics; mass diffusion and interphase mass transfer.

111. Introduction to Food Processing (4) I, Miller
Lecture—3 hours; discussion-demonstration—2 hours. Prerequisite: Bacteriology 2, Chemistry 8A-8B, and Physics

NOTE: For key to footnote symbols, see page 123.

2A-2B, or the equivalent. Food processing from farm to package. Characteristics of raw materials, fresh produce handling, overview of food processing and processing unit operations, chemical additives. Demonstration and field trips.

117. The Senses, Sensory Measurement, Psychophysics and Food (4) I, O'Mahony
Lecture—4 hours. Prerequisite: Biological Sciences 1, Statistics 13 or Agricultural Science and Management 150 (may be taken concurrently). Structure and function of sensory receptor systems; psychological and physiological variables affecting sensory responses. Critical examination of modern psychophysical methods for the investigation of the mechanisms of human sensory systems. Problems of sensory measurement and their relation to food flavor.

119AT. Principles of Dairy Processing (4) III. Dunkley
Personalized system of instruction. Prerequisite: Bacteriology 2; Chemistry 8B. Technical principles related to the commercial processing of milk from the farm to the consumer; includes fluid, concentrated, dried and frozen products, butter, and cheese; theory and practical applications.

120. Principles of Meat Science (3) III. Bandman, Lee (Animal Science)
Lecture—3 hours. Prerequisite: Biochemistry 101B or the equivalent. Anatomical, physiological, development and biochemical aspects of muscle underlying the conversion of muscle to meat. Includes meat processing, preservation, microbiology and public health issues associated with meat products. (Same course as Animal Science 120.)

120L. Meat Science Laboratory (2) III. Lee (Animal Science), Bandman
Discussion—1 hour; laboratory—3 hours. Prerequisite: Biochemistry 101B; course 120 (may be taken concurrently). Laboratory exercises and student participation in transformation of live animal to carcass and meat, structural and biochemical changes related to meat quality, chemical and sensory evaluation of meat, and field trips to packing plant and processing plant. (Same course as Animal Science 120L.)

121. Birds and their Eggs as Food (3) I, King (Avian Sciences)
Lecture—3 hours; demonstrations. Prerequisite: consent of instructor: Biochemistry 101B recommended. Avian products as food considered from the physical, chemical and nutritional aspects. Factors affecting processing, preservation and quality.

122. Marine Food Science (3) II. Ogrydziak
Lecture—3 hours. Prerequisite: Bacteriology 2; Biochemistry 101B (may be taken concurrently). Biochemical, microbiological, and ecological principles unique to fish: where fish are found and why; fishing and landing techniques as they influence quality; processing, storage, and public health aspects of marine organisms; resource development including aquaculture.

125. Corrosion Principles in Food Processing Interactions (3) II. Gruenwedel
Lecture—3 hours. Prerequisite: Mathematics 16B; Physics 2C; Chemistry 8B. Course presents thermodynamic and kinetic principles of container-product interactions (internal corrosion) and investigates how these interactions affect the wholesomeness of processed, canned foods.

128. Food Toxicology (3) III. Gruenwedel, Shibamoto (Environmental Toxicology)
Lecture—3 hours. Prerequisite: Biochemistry 101A, 101B. Chemistry and biochemistry of toxins occurring in foods, including plant and animal toxins, intentional and unintentional food additives. The assessment of food safety and toxic hazards. (Same course as Environmental Toxicology 128.)

130. Chemistry of Milk and Dairy Products (3) II. L. M. Smith, G. M. 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. Luh, 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.

140. Food Laws and Regulation (3) I, Loiseaux (Law)
Lecture—3 hours. Prerequisite: upper division standing. Legal and scientific issues involved in the regulation of the nation's food supply and nutritional status. Philosophy underpinning the application of regulatory statutes. Sources of information necessary for communication with government on public food policy information.

150. Thermal Processing of Foods (3) III. Merson
Lecture—2 hours; discussion, demonstration, and problem workshops—2 hours. Prerequisite: courses 104 and 110B or the equivalent. Theory and practical considerations of thermal processes by canning, pasteurization, and aseptic processing. Process calculations of microbial inactivation and chemical changes to safeguard public health, nutrition, and consumer acceptance. Description and engineering analysis of thermal processing equipment.

150L. Thermal Processing Laboratory (2) III. Merson
Laboratory—6 hours. Prerequisite: courses 104 and 110B; course 150 (may be taken concurrently). Laboratory exercises and student participation in the use and application of thermal processing methods and related procedures, and the interpretation of results, including evaluation of can closures, operation of thermal processing equipment, and the development and testing of sterilization processes.

151. Freezing Preservation of Food (3) III. Reid
Lecture—3 hours. Prerequisite: course 110B, Bacteriology 2, and Chemistry 8B; course 104 recommended. Freezing of model systems and food with emphasis on physicochemical aspects. Consequences of food freezing and thawing. Modeling of freezing for predictive purposes. Visualization and characterization of frozen materials.

156. Computer Interfacing for Laboratory and Process Control (4) III. Russell, Shoemaker
Lecture—3 hours; laboratory—3 hours. Prerequisite: consent of instructors. Principles of micro and minicomputer use in measurement and control of laboratory instrumentation and processing operations with both theoretical and practical aspects of computer interfacing.

190. Senior Seminar (1) I, Reid, Schweigert
Seminar—1 hour. Prerequisite: senior standing or consent of instructor. Selected topics presented by students on recent advances in food science and technology. Reports and discussions concerning oral and written presentations, literature sources and career opportunities.

192. Internship for Advanced Undergraduates (1-12) I, II, III. The Staff (Schweigert in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work experience on or off campus in the practical application of food science.(P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Schweigert in charge)
(P/NP grading only.)

Graduate Courses

201. Biochemistry and Food Science (3) I, Tappel
Lecture—3 hours. Prerequisite: Biochemistry 101B. Topics on enzymes, proteins, pigments, lipids and vitamins. Biochemical principles and methods related to food composition, preservation and processing. Includes research proposals and group problem solving.

202. Chemical and Physical Changes in Food (3) II. Whitaker, Reid, Romani (Pomology)
Lecture—3 hours. Prerequisite: Biochemistry 101B; Chemistry 107B. Fundamental principles of chemistry and physics are applied to a study of changes in water binding properties and activity, changes in proteins, nutrients, toxic constituents, and other compounds during storage, heating, freezing, dehydrating and concentrating of food materials.

205. Industrial Microbiology (3) I, Ogrydziak
Lecture—3 hours. Prerequisite: Biochemistry 101A-101B and Bacteriology 2; Bacteriology 130A-130B or Genetics 102 recommended. Use of microorganisms for producing substances such as amino acids, peptides, enzymes, antibiotics and organic acids. Emphasis on metabolic regulation of pathways leading to fermentation products, on yeast fermentations, and on genetic manipulations (including recombinant DNA techniques) of industrial microorganisms. Offered in even-numbered years.

206. Biochemical Engineering (2) II. Ryu (Viticulture and Enology)
Lecture—2 hours. Prerequisite: Bacteriology 2, 3, courses 110A, and 110B; course 205 recommended. Interaction of chemical engineering, biochemistry, and microbiology. Mathematical representations of microbial systems. Kinetics of growth, death, and metabolism. Continuous fermentation, agitation, mass transfer and scale-up in fermentation systems, product recovery, enzyme technology. Offered in odd-numbered years.

207. Advanced Sensory-Instrumental Analyses (3) III. Noble (Viticulture and Enology), Pangborn
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 107 and consent of instructor. Basic principles of measurement of color, texture, and flavor of foods by sensory and instrumental methods. Advanced statistical analysis of relation of colorimetry, texturometry and chemistry of volatile compounds to perception of appearance, texture, flavor. Offered in even-numbered years.

210. Proteins: Functional Activities and Interactions (3) II.
Lecture—3 hours. Prerequisite: Biochemistry 101B. The relationships of structure of proteins to their biological functions. Structural proteins, complexing proteins, and catalytic proteins in plant and animal materials and products.

211. Chemistry of the Food Lipids (3) III. L. Smith
Lecture—3 hours. Prerequisite: Biochemistry 101A. Chemical constitution, molecular structure, and stereo chemistry of the fats, phospholipids, and related compounds. Methods of isolation, characterization, and synthesis. Relation of molecular structure to physical properties. Offered in odd-numbered years.

235. Mycology of Food and Food Products (3) III. Miller
Lecture—3 hours. Prerequisite: course 104 and consent of instructor. Morphology and physiology of fungi associated with food. Desirable activities of fungi: food fermentations, single-cell protein production, mushroom culture. Undesirable activities: preharvest and postharvest deterioration, food spoilage and preservation, toxin production.

250. Isolation and Characterization of Trace Volatiles (3) I, Jennings
Lecture—3 hours. Prerequisite: at least one introductory course in inorganic chemistry, organic chemistry, physics. Gas chromatographic theory; preparation, evaluation and use of columns; sample preparations and recovery, qualitative and quantitative analysis; ultraviolet, infrared and mass spectrometry.

251. Isolation and Characterization of Trace Volatiles (2) I, Jennings
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 250 (must be taken concurrently). Laboratory demonstrations and discussions of methods for optimizing gas chromatographic performance, treatment of retention data, preparation and evaluation of packed, SCOT and open tubular glass capillary columns, sample preparation and trapping, microreaction coupled with gas chromatography infrared and mass spectrometry.

290. Seminar (1) I, II, III. The Staff (Schweigert in charge)
Seminar—1 hour. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. The Staff (Schweigert in charge)
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Critical presentation and evaluation of original research by graduate students. Planning of research programs and proposals. Discussion led by individual major instructors for their research group. (S/U grading only.)

291. Advanced Food Science Seminar (1) III.
Seminar—1 hour. Prerequisite: completion of at least one quarter of course 290. Oral presentation of student's original research, discussion and critical evaluation. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (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 168). 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

NOTE: For key to footnote symbols, see page 123.

under the Unrestricted Electives of the Dietetics major.

Related Courses. See Food Science and Technology, and Nutrition.

Courses in Food Service Management

Questions pertaining to the following courses should be directed to the instructor or to the Nutrition Department Office, 109 Everson Hall.

Upper Division Courses

120. Principles of Quantity Food Production (3) III. Prophet
Lecture—3 hours. Prerequisite: Food Science and Technology 100B and 101B. Fundamental principles of food service management including quantity food preparation, institutional equipment, receiving and storage, service, menu planning, merchandising, and safety.

120L. Quantity Food Production Laboratory (2) I, II. Prophet, Zeman
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 (Rucker in charge)
Lecture—3 hours. Prerequisite: a basic course in general psychology. Major personnel management functions; legal constraints and requirements; procedures in solving personnel problems faced by supervisors.

192. Internship (1-12) I, II, III. The Staff (Rucker in charge)
Lecture—3-36 hours. Prerequisite: one upper division course in Food Service Management and consent of instructor. Work experience on or off campus in practical aspects of food service management, supervised by a faculty member. (P/NP grading only.)

197T. Tutoring in Food Service Management (1-2) I, II, III. The Staff (Prophet in charge)
Discussion-laboratory—3 or 6 hours. Prerequisite: Dietetics or related major; completion of the Food Service Management course in which tutoring is done. Tutoring of students in food service management, assistance with discussion groups or laboratory sections; weekly conference with instructor in charge of course; written evaluations. May be repeated if tutoring a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Rucker in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Rucker in charge)

Foreign Literature in Translation

See Literature in Translation

French

(College of Letters and Science)

Ruth B. York, Ph.D., Chairperson of the Department

Department Office (French and Italian), 513 Sproul Hall (752-0830)

Faculty

Claude Abraham, Ph.D., Professor
[3,4]Max Bach, Ph.D., Professor
Marc Eli Blanchard, Agrégé de Lettres, Professor
[2]Edward M. Bloomberg, Ph.D., Associate Professor
Richard N. Coe, Ph.D., F.A.H.A., Professor
Ruby Cohn, Ph.D., Professor *(Comparative Literature, Dramatic Art)*
Peter Hampshire, D.Litt., Visiting Professor
Gerald Herman, Ph.D., Associate Professor
Margo R. Kaufman, M.A., Lecturer
[2]Manfred Kusch, Ph.D., Associate Professor
[2]Marshall Lindsay, Ph.D., Professor
[4]Maria I. Manoliu-Manea, Ph.D., Professor
Ruth B. York, Ph.D., Senior Lecturer

The Program of Study

The Program offers courses in language, culture, and literature (the latter in French and in translation) most of which may be taken to satisfy the Humanities Area Requirement.

Although a major or minor in French is excellent preparation for prospective teachers or for those contemplating careers in government or business, it has broader applications and is designed for those wishing to obtain solid training in a humanistic discipline and to enrich themselves through the study of a foreign culture, thus enabling themselves to play a more enlightened role in the international picture. It is an excellent preparation for professional schools.

The UCD facilities and activities supporting these programs are manifold: an up-to-date language laboratory, a departmental reading room, a superb research library, the French Club, and the Pi Delta Phi National French Honorary Society to name just a few. There are, of course, close ties to several French campuses, thanks to the Universitywide Education Abroad Program.

The Major and Minor Programs

Two tracks of study are available to prospective majors and minors, one emphasizing the language, the other the literature. Both train the students in all four of the language skills (reading, writing, speaking, and understanding). *Plan A* is usually followed by students interested in teaching, a career in the arts, general cultural positions, or graduate studies in French. *Plan B* is generally selected by those interested in teaching, international business, or government work.

French

A.B. Major Requirements:

	UNITS
Plan A: Literature Emphasis	
Preparatory Subject Matter	**12-35**
French 1, 2, 3, 4 (or the equivalent)	0-23
French 6, 30A, 30B	12
French 45 strongly recommended	
Depth Subject Matter	**44**
French 101, 102, 103	12
French 135	4
One course chosen from each of four of the following literary periods (a-f)	16
a. Medieval period: French 115	
b. Sixteenth century: French 116	
c. Seventeenth century: French 117A, 117B, 117C	
d. Eighteenth century: French 118A, 118B	
e. Nineteenth century: French 119A, 119B, 119C	
f. Twentieth century: French 120A, 120B, 121, 122, 123	
Additional upper division units in French language or literature	8
One additional upper division course in a national literature other than French, or in Comparative Literature	4
Total Units for the Major (Plan A)	**56-79**
Plan B: Language Emphasis	
Preparatory Subject Matter	**14-37**
French 1, 2, 3, 4 (or the equivalent)	0-23
French 6, 30A, 30B, 59	14
Depth Subject Matter	**44**
Two courses chosen from French 101, 102, 103	8
French 104, 110, 135, 160, 161	20
Four courses chosen from French 106, 107, 138, 159, 162	16
(One upper division literature course may be substituted for one of the above four courses.)	
Total Units for the Major (Plan B)	**58-81**

Recommended
French 108A, 108B; French 107 and 160 for students interested in obtaining a "single subject" teaching credential in California.

Major Adviser. G. Herman.

Minor Program Requirements:

The minor in French may be pursued with emphasis on either literature or language and civilization.

	UNITS
French	**24**
(Literature emphasis)	**24**
Two courses chosen from French 101, 102, 103	8
Four upper division literature courses chosen in consultation with undergraduate adviser from at least three of the following periods (a-f)	16
(a) Middle ages	
(b) Sixteenth century	
(c) Seventeenth century	
(d) Eighteenth century	
(e) Nineteenth century	
(f) Twentieth century	
(Language and Civilization emphasis)	**24**
French 104, 107, 110 or 138, 135	16
Two additional courses chosen in consultation with undergraduate adviser in French language or literature, or in French culture offered outside the department	8

Prerequisite Credit. Credit will not normally be given for a course if it is prerequisite to a course already successfully completed. Exceptions can be made by the Department Chairperson only.

Graduate Study. The Department offers programs of study and research leading to the M.A. and Ph.D. degrees in French.

The Master of Arts degree program is available to students who complete an undergraduate major in French or the equivalent. Students, in special circumstances, may make up work deficient to the major requirements and then continue with an advanced degree. Candidates will be recommended for admission to graduate studies in French provided the requirements of the Graduate Division and the Department of French and Italian have been met. Basic requirements are: a minimum residence of three quarters, 36 quarter units, and a passing score in the comprehension examination, or 30 quarter units and the acceptance of a written thesis.

The doctoral program stresses individualized study suited to the student's interest. Particularly encouraged are programs that involve the use of resources in allied departments and programs such as Dramatic Art, Comparative Literature, English, etc. The Department regularly sponsors an exchange program with French institutions of learning. Basic requirements include demonstration of linguistic competence, passing of a qualifying examination, completion of an acceptable dissertation, and one year of teaching in the department as a Teaching Assistant.

Graduate Advisers. M. Lindsay (M.A. degree); R.N. Coe (Ph.D. degree).

Teaching Credential Subject Representative. M. R. Kaufman. See page 98 for Teacher Education Program.

NOTE: For key to footnote symbols, see page 123.

Courses in French

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.

Lower Division Courses

1G. French for Graduate Students (5) Extra-session summer. The Staff (Chairperson in charge)
Lecture-discussion—5 hours. A course designed to prepare students for the graduate reading examination in French. (P/NP grading only.)

1. Elementary French (6) I, II, III. The Staff
Discussion—5 hours; laboratory—two ½-hour sessions. Students who have successfully completed (C− or better) French 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.

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
Discussion—3 hours. Prerequisite: course 4 or the equivalent. Reading of selected literary texts with emphasis on problems of syntax, style, and vocabulary development. Class discussion and composition.

8A. French Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 3. Practice in speaking French. May be repeated once for credit. (P/NP grading only.)

8B. French Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 4. Practice in speaking French. May be repeated once for credit. (P/NP grading only.)

25. French Literature in Translation (3) I, II, III. The Staff (Chairperson in charge)
Lecture—1 hour; discussion—2 hours. Course is intended to acquaint the non-major with representative examples of French literature. Selected topics will include major authors, genres, literary periods, movements, or special themes.

30A. Advanced Grammar (4) I, II, III. The Staff
Lecture-discussion—3 hours; written papers and reports. Prerequisite: course 6. Grammar review, composition, and the reading and discussion of literary texts.

30B. Advanced Grammar (4) I, II, III. The Staff
Lecture-discussion—3 hours; written papers and reports. Prerequisite: course 30A or placement by examination. Continuation of course 30A.

35. Explication and Dissertation (2) III. The Staff (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.

45. Introduction to French Literature (4) I, II, III. The Staff
Lecture-discussion—3 hours; short papers. Prerequisite: course 6 or the equivalent. Selected themes in French literature.

59. Introduction to French Phonetics (2) I, II, III. The Staff (Manoliu-Manea in charge)
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 4 or the equivalent. Practically oriented presentation of French sounds and intonational patterns. Laboratory drills with emphasis on phonetic features specific to contemporary spoken French.

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

101. Introduction to French Poetry (4) I, Abraham
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 30B or consent of instructor. Analysis and evaluation of works representing the main types of French poetry. Study of French poetic conventions and versification.

102. Introduction to French Drama (4) II. Coe
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 30B or consent of instructor. Analysis and evaluation of plays representing the main types of French drama, with emphasis on dramatic structure and techniques.

103. Introduction to French Prose (4) III. Kusch
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 30B or consent of instructor. Analysis and evaluation or works representing main types of French prose, with emphasis on narrative structure and techniques.

104. Translation and Composition (4) I, II. The Staff
Lecture-discussion—3 hours; essays. Prerequisite: course 30B or the equivalent. Practice in translation into French using a variety of texts illustrating different problems and styles; practice in French composition.

106. French in Business and the Professions (4) I, Herman
Lecture—1 hour; discussion—2 hours; frequent written assignments. Prerequisite: course 30B or the equivalent. The French language as used in the commercial sphere. Emphasis on proper style and form in letter-writing, and in non-literary composition. Technical terminology in such diverse fields as government and world business.

107. Contemporary France (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; term paper—30 hours minimum. Prerequisite: course 6. Introduction to aspects of French culture and institutions of the contemporary period such as art, architecture, music, literature. Provides a background in French contemporary history, sociology and institutions.

108A. Advanced French Conversation (2) I. The Staff (Chairperson in charge)
Discussion—3 hours. Prerequisite: course 30A. Intensive conversational practice stressing accurate pronunciation and spoken language fluency. Not open to native speakers. May not be counted toward the French major. May be repeated once for credit. (P/NP grading only.)

108B. Advanced French Conversation (2) III. The Staff (Chairperson in charge)
Discussion—3 hours. Prerequisite: course 30B. Intensive conversational practice stressing accurate pronunciation and spoken language fluency. Not open to native speakers. May not be counted toward the French major. May be repeated once for credit. (P/NP grading only.)

110. Stylistics and Creative Composition (4) III. Herman
Lecture—3 hours; frequent papers—30 hours minimum. Prerequisite: course 104 or consent of instructor. Intensive course in creative composition using a variety of techniques and literary styles, patterned on Queneau's *Exercises de style*. Practice in such stylistic modifications as inversion, antithesis, changes in tense, mood, tonality, etc. The writing of poetry.

***115. Medieval Literature: Epic & Romance** (4) I, Herman
Lecture—3 hours; term paper. Prerequisite: course 101 or 103 or consent of instructor. *La Chanson de Roland, Tristan et Iseut,* and selected works of Chrétien de Troyes. Texts to be read in modern French. Offered in even-numbered years.

116. Literature of the Sixteenth Century (4) I, Blanchard
Lecture—3 hours; term paper. Prerequisite: course 103 or consent of instructor. Rabelais and Montaigne. Critical study of the works in relationship to the period. Offered in odd-numbered years.

***117A. Classical Tragedy** (4) III. Abraham
Lecture—3 hours; term paper. Prerequisite: course 102 or consent of instructor. Study of plays of Racine and Corneille. Offered in even-numbered years.

***117B. Classical Comedy** (4) III. Abraham
Lecture—3 hours; term paper. Prerequisite: course 102 or consent of instructor. Study of works of Molière and other writers of comedy of the seventeenth century. Offered in odd-numbered years.

117C. The *Moralistes* (4) III. Bloomberg
Lecture—3 hours; term paper. Prerequisite: course 103 or consent of instructor. Study of works of such *moralistes* as Pascal, La Rouchefoucauld, La Bruyère, Descartes, the Chevalier de Méré, and Boileau. Offered in even-numbered years.

118A. *Les Philosophes (4) III. Kusch
Lecture—3 hours; term paper. Prerequisite: course 103 or consent of instructor. Readings from Montesquieu, Voltaire, Diderot, Rousseau and the Encyclopedie. Offered in odd-numbered years.

***118B. The Novel in the Eighteenth Century** (4) I, Kusch
Lecture—3 hours; term paper. Prerequisite: course 103 or consent of instructor. Novels of Lesage, Prévost, Diderot, Rousseau, Laclos, Sade. Offered in even-numbered years.

119A. The Nineteenth Century (4) II. Coe
Lecture—3 hours; term paper. Prerequisite: course 102 or 103 or consent of instructor. Romanticism in the drama and novel. Plays of Hugo and Musset, novels of Stendhal, Nerval, Flaubert, Mérimée, and Chateaubriand. Offered in odd-numbered years.

***119B. The Nineteenth Century** (4) III. Coe
Lecture—3 hours; term paper. Prerequisite: course 103 or consent of instructor. Realism and Naturalism: Balzac, Flaubert, Maupassant, Zola.

***119C. Nineteenth-Century Poetry** (4) III. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 101 or consent of instructor. Study of representative poets from Romanticism through Symbolism, such as Hugo, Musset, Baudelaire, Verlaine, Rimbaud, Corbière, Laforgue and Lautréamont. Offered in even-numbered years.

***120A. Twentieth-Century Drama** (4) I, York
Lecture—3 hours; term paper. Prerequisite: course 102 or consent of instructor. Representative plays from Jarry to Giraudoux. Offered in even-numbered years.

120B. Twentieth-Century Drama (4) II. York
Lecture—3 hours; term paper. Prerequisite: course 102 or consent of instructor. Representative plays from Anouilh to Arrabal. Offered in odd-numbered years.

***121. Twentieth-Century Novel** (4) I, Lindsay
Lecture—3 hours; term paper. Prerequisite: course 103 or consent of instructor. Sotie, *récits* and novel of André Gide and novels of Marcel Proust. Offered in even-numbered years.

122. Twentieth-Century Novel (4) II. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 103 or consent of instructor. From Malraux to the Nouveau Roman, including such novelists as Sartre, Camus, de Beauvoir, Bernanos, Mauriac, Céline, Robbe-Grillet, Simon, Butor. Offered in odd-numbered years..

***123. Twentieth-Century Poetry** (4) III. Lindsay
Lecture—3 hours; term paper. Prerequisite: course 101 or consent of instructor. Selected poetic texts from Apollinaire to the present, including such poets as Saint-John, Perse, Breton, Aragon, Reverdy, Eluard, Desnos, Ponge, Char, Michaux, Bonnefoy. Offered in even-numbered years.

135. Advanced Composition (4) II, III. The Staff (Chairperson in charge)
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 104. Practice in advanced composition, using the French *dissertation* as model, with occasional *explications de texte*.

138. Advanced Literary Translation (4) III. Bloomberg
Lecture-discussion—3 hours; term paper. Prerequisite: course 104. 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 101 or 102 or 103 as appropriate to the selected topic or consent of instructor. Concentrated study of works of a single author. May be repeated once for credit as author-subject changes. Offered in even-numbered years.

***141. Selected Topics in French Literature** (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; term paper or short papers—30 hours minimum. Prerequisite: course 101 or 102 or 103 as appropriate to the selected topic or consent of instructor. Subjects and themes such as satiric and didactic poetry of the Middle Ages, poetry of the Pléiade, theater in the eighteenth century, pre-romantic poetry, etc. May be repeated once for credit in a different subject area. Offered in odd-numbered years.

150. Masterpieces of French Literature (4) II. Blanchard
Lecture-discussion—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** (3) I. Manoliu-Manea
Lecture-discussion—3 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) I. Manoliu-Manea
Lecture—3 hours; term paper. Prerequisite: courses 30A, 30B, and 59, or consent of instructor. Analysis of the content and functions of the main grammatical categories of French in the framework of recent structural approaches.

161. Modern French Syntax (4) II. Manoliu-Manea
Lecture—3 hours; short papers—30 hours minimum. Pre-

NOTE: For key to footnote symbols, see page 123.

requisite: course 160. Presentation of basic concepts of contemporary approaches to French syntax. Consideration of new explanations of so-called "irregular" phenomena in current language models. Offered in even-numbered years.

***162. History of French Language** (4) III. Manoliu-Manea
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 30B or the equivalent. Main periods in development of the French language, from Latin to contemporary popular aspects, with emphasis on relationship between socio-cultural patterns and evolution of the language. Offered in odd-numbered years.

197T. Tutoring in French (1-4) I, II, III. Kaufman
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of Chairperson. Tutoring in undergraduate courses including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

197TC. Tutoring in the Community (2-4) I, II, III. Kaufman
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of Chairperson. Tutoring in public schools under the guidance of a regular teacher and supervision by a departmental faculty member. May be repeated for credit for a total of 6 units. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chaiperson in charge)
(P/NP grading only.)

Graduate Courses

***200A. "Analyse Littéraire"** (4) I, Lindsay
Seminar—3 hours; term paper. Prerequisite: graduate standing. Introduction to the methodology and practice of literary criticism. Textual reading and group study of one selected work.

***200B. "Analyse Littéraire"** (4) II. Blanchard
Seminar—3 hours; term paper. Prerequisite: graduate standing. Further introduction to methodology. Theory of literature and philosophy of criticism, writing and reading, in the context of today's controversy. Study of selected critical approaches against specific texts.

***201. History of French: Phonology and Morphosyntax** (4) II. Manoliu-Manea
Seminar—3 hours; term paper. Prerequisite: courses 159, 160, 250A, or consent of instructor. Presentation of the main changes in the phonematic and grammatical structures of French, from Latin to contemporary spoken aspects. Offered in odd-numbered years.

202A. Medieval French Literature: The Epic Tradition (4) II. Herman
Seminar—3 hours. Prerequisite: course 201 recommended. Literary and stylistic study of selected *chansons de geste*. Readings in Old French. May be repeated for credit with consent of instructor when different topic studied.

***202B. Medieval French Literature: The Romance Tradition** (4) III. Herman
Seminar—3 hours. Prerequisite: course 201 recommended. Chrétien de Troyes and the doctrine of courtly love. Literary and stylistic study of Chrétien's major works. Readings in Old French. May be repeated for credit with consent of instructor when different topic is studied.

205A. Sixteenth-Century Literature: The Humanists (4) I, Blanchard
Seminar—3 hours. French humanism in its most varied forms. Although at different times Rabelais and Montaigne will be primarily studied, other leading intellectuals and religious writers will also receive attention. May be repeated for credit when different topic is studied.

***205B. Sixteenth-Century Literature: Pre-Renaissance and Renaissance Poets** (4) I, Lindsay
Seminar—3 hours. The poetry of the *Ecole lyonnaise* and of the *Pléiade*. May be repeated for credit when different topic is studied.

206A. Seventeenth-Century Literature: Theater (4) I, Hampshire
Seminar—3 hours. Works of Corneille, Racine, Molière, and minor dramatists. One or more authors may be covered. May be repeated for credit with consent of instructor when different topics are studied.

***206B. Seventeenth-Century Literature: Prose** (4) I. The Staff
Seminar—3 hours; term paper and/or exposé. Works of authors such as Pascal, Descartes, Mme de Lafayette. One or more authors may be covered. May be repeated for credit with consent of instructor as different topics are studied from quarter to quarter.

***206C. Seventeenth-Century Literature: Poetry** (4) III. Abraham
Seminar—3 hours; term paper and/or exposé. Studies of the works of one or more poets of the period. May be repeated for credit with consent of instructor.

207A. Eighteenth-Century Literature: Philosophes (4) II. Kusch
Seminar—3 hours; term paper and/or exposé. Not a course in philosophy, but an examination of the role of philosophy in the design and context of literary works. Study of one or more authors. May be repeated for credit.

***207B. Eighteenth-Century Literature: Novel** (4) III. Kusch
Seminar—3 hours. Rise of the novel. A study of narrative experiments in the context of the philosophical climate and new literary values. Course may treat one or more novelists of the period. May be repeated for credit when different topics are studied.

***208A. Nineteenth-Century Literature: Fiction** (4) II. Blanchard
Seminar—3 hours. Study of the works of one or several novelists and/or short-story writers of the period. May be repeated for credit with consent of instructor when different topics are studied.

***208B. Nineteenth-Century Literature: Theater** (4) II. The Staff
Seminar—3 hours. Study of the works of one or more dramatists of the period. May be repeated for credit with consent of instructor when different topics are studied.

***208C. Nineteenth-Century Literature: Poetry** (4) II. Lindsay
Seminar—3 hours. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor when different topics are studied.

***209A. Twentieth-Century: Prose** (4) III. The Staff
Seminar—3 hours; term paper and/or exposé. Study of the works of one or several writers of the period.

***209B. Twentieth-Century: Theater** (4) II. Cohn
Seminar—3 hours; term paper and/or exposé. Study of the works of one or several dramatists of the period. May be repeated for credit with consent of instructor.

***209C. Twentieth-Century: Poetry** (4) II. The Staff
Seminar—3 hours; term paper and/or exposé. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor.

***210. Studies in Narrative Fiction** (4) III. The Staff
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

***211. Studies in Criticism** (4) III. Coe
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

212. Studies in the Theater (4) II. Cohn
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

***213. Studies in Poetry** (4) III. The Staff
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

214. Study of a Literery Movement (4) III. Lindsay, Coe
Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

238. Problems in French Composition and Syntax (4) III. Bloomberg
Seminar—3 hours. Prerequisite: graduate standing. Problems and techniques of English-French translation: morphological, syntactical, and stylistic.

***250A. French Linguistics: Morphematics** (4) I, Manoliu-Manea
Seminar—4 hours. Prerequisite: courses 159, 160, or consent of instructor. Theoretical approach to French grammar, with emphasis on morphematics, i.e., a semantic analysis of grammatical categories, as well as of their paradigmatic and syntactic relations. Offered in even-numbered years.

***250B. French Linguistics: Transformational Syntax** (4) I, Manoliu-Manea
Seminar—4 hours. Prerequisite: course 250A or consent of instructor. Presentation of French syntax exemplified by a core of transformational rules (such as subjectivization, passivization, relativization, etc.) focusing on the most recent developments in the field (i.e., case grammars, generative semantics, trace theory, etc.). Offered in odd-numbered years.

251. Trends in French Contemporary Linguistics (4) I, Manoliu-Manea
Seminar—3 hours; term paper. Prerequisite: course 250A or 250B or consent of instructor. Issues in contemporary French linguistic thought and their relationship to the development of theoretical linguistics. Topics such as pragmatics, semantics, symbolic logic, speech acts, etc. Intended for students in French linguistics or those interested in applying linguistic models to literature. Offered in even-numbered years.

290. Research Methods (2) I. Graduate Staff
Proseminar—2 hours. Prerequisite: graduate student standing. Required of all graduate students in French. Introduces students to tools of research and to the various critical methods. (S/U grading only.)

297. Individual Research (1-5) I, II, III. The Staff
(S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Seminar—1-5 hours. May be repeated for credit with consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

300. Teaching of a Modern Foreign Language (3) III. Kaufman
Lecture-discussion—3 hours. Prerequisite: senior or graduate standing; a major or minor in a modern foreign language.

390A. The Teaching of French in College (2) I, Kaufman
Lecture—1 hour; discussion—1 hour. Course designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the University.

390B. The Teaching of French in College (1) II. Kaufman
Seminar—1 hour. Course designed for graduate teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the University.

Genetics

(College of Agricultural and Environmental Sciences)

Leslie D. Gottlieb, Ph.D., Chairperson of the Department

Department Office, 357 Briggs Hall (752-0200)

Faculty

[1]Robert W. Allard, Ph.D., Professor
Francisco J. Ayala, Ph.D., Professor
James B. Boyd, Ph.D., Professor
Gordon J. Edlin, Ph.D., Professor
John H. Gillespie, Ph.D., Professor
Leslie D. Gottlieb, Ph.D., Professor
Melvin M. Green, Ph.D., Professor Emeritus
Paul E. Hansche, Ph.D., Professor *(Genetics, Pomology)*
[1]John A. Kiger, Jr., Ph.D., Professor
Timothy Prout, Ph.D., Professor *(Genetics, Entomology)*
Raymond L. Rodriguez, Ph.D., Associate Professor
Che-Kun J. Shen, Ph.D., Associate Professor
S. Richard Snow, Ph.D., Professor
G. Ledyard Stebbins, Ph.D., Professor Emeritus
Michael A. Turelli, Ph.D., Associate Professor

The Major Program

The Genetics major is designed to provide a broad background in the biological, mathematical, and physical sciences basic to the study of heredity and evolution. The major is sufficiently flexible to accommodate students interested in the subject either as a basic discipline in the biological sciences or in terms of its applied aspects in improving domestic plants and animals.

Choice of College. Students may elect this major either in the College of Agricultural and Environmental Sciences or in the College of Letters and Science.

Students majoring in Genetics in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis. Further information can be obtained from the Division of Biological Sciences office, 150 Mrak Hall.

NOTE: For key to footnote symbols, see page 123.

Genetics

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**61-70**
Bacteriology 102 or 2 (102 recommended); 3	4-5
Biological sciences (Biological Sciences 1)	5
Botany 2	5
Chemistry (Chemistry 1A-1B-1C or 4A-4B-4C; 8A-8B or 128A-128B-128C)	21-24
Mathematics (Mathematics 16A-16B-16C or 21A-21B-21C)	9-12
Statistics 13 or 102 (102 recommended)	4
Physics (Physics 2A-2B-2C)	9
Zoology 2; 2L recommended	4-6
Depth Subject Matter	**25-30**
Biochemistry 101A-101B	6
Genetics 100A-100B or 120-100B, 100L	7-8
Four additional courses in genetics	12-16
Include at least one course from Group A: Genetics 102A, 102B, 102L, 104; and one course from Group B: Genetics 103, 105.	
Breadth Subject Matter	**36**
College of Agricultural and Environmental Sciences students:	
English and/or rhetoric (see College requirement)	8
Social sciences and/or humanities†	28
Additional requirements as described on page 71	
College of Letters and Science students: Refer to page 88 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 the student's interest chosen in consultation with the adviser. At least two areas are to be represented, such as agricultural science, behavioral biology, biochemistry, cell biology, environmental biology, statistics, physiology, and systematics.	
Unrestricted Electives	**15-42**
Total Units for the Major	**180**

Major Adviser. G. J. Edlin.

Graduate Study. The Graduate Group in Genetics offers study and research leading to the M.S. and Ph.D. degrees in Genetics (see page 220).

Related Courses. See Agronomy 221, 222, 224, 225, 230; Animal Genetics 107, 108, 204, 206, 207; Anthropology 151, 152, 153, 157, 157L, 280, 292; Biochemistry and Biophysics 201C, 204; Genetics Graduate Group; Plant Pathology 215; Plant Science 103, 113, 122; Psychology 251; Vegetable Crops 220; Zoology 148, 149, 158.

Courses in Genetics

Lower Division Courses

10. Heredity and Evolution (4) I, Edlin; III. Ayala
Lecture—3 hours; discussion—1 hour. Course intended for liberal arts students. Examines principles and recent developments in genetics and evolution in context of their social implications.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Individual study for undergraduates. (P/NP grading only.)

Upper Division Courses

100A. Principles of Genetics (3) I, Boyd; II, Snow
Lecture—3 hours; or autotutorial—2 hours and general assembly—1 hour. Prerequisite: Biological Sciences 1, and either Bacteriology 2 (especially relevant), Botany 2, or Zoology 2. An introduction to genetics, covering the areas of classical molecular and biochemical, and developmental genetics. Not open for credit to students who have received credit for Genetics 120.

100B. Principles of Genetics (3) II, III. Hansche
Lecture—3 hours; or autotutorial—2 hours and general assembly—1 hour. Prerequisite: course 100A; a course in statistics. Continuation of course 100A, covering topics of cytogenetics, quantitative, population, and evolutionary genetics. Not open for credit to students who have received credit for Genetics 120.

100L. Principles of Genetics Laboratory (1) I, II. Boyd
Laboratory—3 hours. Prerequisite: course 100A or 120; Bacteriology 3. Laboratory work in basic genetics to supplement courses 100A, 100B, and 120.

102A. Molecular Genetics (3) II.
Lecture—3 hours. Prerequisite: course 100A or 120; Biochemistry 101B. Analysis of the fundamental discoveries of prokaryotic molecular genetics.

102B. Molecular Genetics (3) III. Shen
Lecture—3 hours. Prerequisite: course 102A. Continuation of course 102A, emphasizing fundamental discoveries in eukaryotic molecular genetics, transposable elements, and mechanisms of recombination.

102L. Advanced Molecular Genetics Laboratory (4) III. Rodriguez
Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 100L, 102A, Biochemistry 101L, and consent of instructor; Bacteriology 130L recommended. Genetic analysis of gene structure and function using recombinant DNA technology. Experiments involve the isolation of prokaryotic genes to demonstrate the genetic principles of complementation, transformation, and gene expression. Limited enrollment.

103. Organic Evolution (3) III. Gillespie
Lecture—3 hours. Prerequisite: course 100B or 120. Evolutionary processes in higher organisms.

104. Developmental Genetics (4) I.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A or 120; Biochemistry 101B; Zoology 100 recommended. Modern concepts of the development and differentiation of vertebrates and other higher organisms. Emphasis is placed on genetic and biochemical approaches to the study of control mechanisms operative at the various levels of gene action.

105. Population Genetics (4) I, Prout
Lecture—4 hours. Prerequisite: course 100B or 120; a course in statistics and Mathematics 16B recommended. An introductory course in the analysis and interpretation of quantitative genetic systems. Course covers Mendelism in populations, with emphasis on the factors affecting the genetic organization of multilocus systems.

108. Philosophy of the Biological Sciences (4) III. Griesemer (Philosophy), Ayala
Lecture-discussion—4 hours. Scientific method in biology. Nature of biological theories, explanations, and models. Problems of evolutionary theory, ecology, and sociobiology. bio-engineering and environmental ethics. (Same course as Environmental Studies 108 and Philosophy 108.)

120. General Genetics (4) I, Gillespie, Shen; III, Turelli, Gottlieb
Lecture—4 hours. Prerequisite: Biological Sciences 1; Bacteriology 2, Botany 2, or Zoology 2; a course in statistics. Course is designed to provide an intensive treatment of the science of genetics for students in the biological sciences who require only a short course in general genetics. Not open to students who have received credit for Genetics 100A-100B.

190C. Introduction to Genetics Research (1) I, II, III, summer. The Staff (Chairperson in charge.)
Discussion—1 hour. Prerequisite: upper division standing in Genetics or related biological sciences; consent of instructor. Discussion and critique of current genetics research by faculty, graduate, and undergraduate students. May be repeated for credit. (P/NP grading only.)

197T. Tutoring in Genetics (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper division standing and consent of instructor. Conducting of discussion groups affiliated with one of the department's regular courses. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor based on adequate preparation of the student in allied fields. (P/NP grading only.)

Graduate Courses

202. Plasmids, Recombinant DNA, and Genetic Engineering (3) II. Edlin
Lecture—3 hours. Prerequisite: course 102A or Bacteriology 130A-130B, or consent of instructor. Presentation of recent experiments in recombinant DNA technology. Description of biochemical and genetic properties of bacterial plasmids. (S/U grading only.) Offered in odd-numbered years.

203. Advanced Evolution (3) III. Gottlieb
Lecture—1 hour; discussion—2 hours. Prerequisite: graduate status. Adaptation, ecological differentiation, and speciation in plants and animals with emphasis on the appropriateness of different methods of analysis. Offered in odd-numbered years.

205. Theoretical Population Genetics (4) II. Turelli
Lecture—4 hours. Prerequisite: course 105; Mathematics 22A, and Statistics 130A or 131A, and consent of instructor; Mathematics 22B recommended. Mathematical theory of population genetics with emphasis on the assumptions underlying the standard models and the mathematical techniques used to derive conclusions. Take-home examination. (S/U grading only.) Offered in odd-numbered years.

***207. Genetic Control of Insect Pests** (3) II. Prout
Lecture—3 hours. Prerequisite: elementary genetics plus population genetics or evolutionary theory; graduate or upper division standing in biological science; some knowledge of insect ecology and model construction recommended. The application of population genetic theory to ways of altering the genetic constitution of pest populations; including sterile male release, delayed sterility methods, sex ratio distortion, the use of various cytogenetic procedures and meiotic drive to transform populations. Offered in even-numbered years. (S/U grading only.) (Same course as Entomology 207.)

***209. Molecular Evolution** (3) III. Gillespie, Gottlieb, Shen, Turelli
Lecture—3 hours. Prerequisite: course 100A or 120, course 100B, Biochemistry 101A-101B; Genetics 103 recommended. Evolution from the molecular standpoint, including the evolution of genome structure and the organization of single genes and gene clusters, evolution of enzymes and metabolic pathways, molecular clocks, transposons and other movable genetic elements, and molecular polymorphisms. Offered in even-numbered years. (S/U grading only.)

210. Genetic Recombination (3) I, Snow
Lecture—1 hour; discussion—2 hours. Prerequisite: course 100B and Biochemistry 101B; course 102B recommended. Study of genetic recombination from the early observations through current research at the molecular level. Offered in even-numbered years.

290C. Research Conference in Genetics (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate standing in Genetics; consent of instructor. Presentations and critical discussions of current research in genetics. Intended primarily for graduate students. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor. Directed group study of special topics in genetics. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Course

300. Methods in Teaching Genetics (1) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—1 hour. Prerequisite: graduate standing in Genetics and consent of instructor. Experience in methods and problems of teaching genetics, including analysis of texts and other materials, teaching techniques, preparing for and conducting discussion and laboratory sections, preparing examinations. May be repeated for credit. (S/U grading only.)

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 123.

Genetics (A Graduate Group)

Leslie D. Gottlieb, Ph.D., Chairperson of the Group

Group Office, 357 Briggs Hall

Graduate Study. The Graduate Group in Genetics offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information regarding the programs, address the chairperson of the group.

Graduate Advisers. Consult Genetics Graduate Group Office.

Courses in Genetics

Graduate Courses

291. Seminar in History of Genetics (2) II. The Staff
Seminar—2 hours. Prerequisite: Genetics 100B or 120. The development of modern genetic theories beginning with Mendel. (S/U grading only.)

292. Seminar in Gene Structure and Action (1-3) III. The Staff
Seminar—1-3 hours. Prerequisite: Genetics 102A or 102B or consent of instructor. Topics of current interest related to the structure of genes, mutation, and the mechanisms of gene action. Offered in odd-numbered years. (S/U grading only.)

***293. Seminar in Cytogenetics and Evolution** (1-3) I. The Staff
Seminar—1-3 hours. Prerequisite: Agronomy 224 or 225 or consent of instructor. Topics of current interest related to chromosomal changes, mutation, and other genetic changes in natural populations, and the application of genetics to the study of organic evolution. Offered in odd-numbered years. (S/U grading only.)

***294. Seminar in Populational, Ecological, and Behavioral Genetics** (1-3) II. The Staff
Seminar—1-3 hours. Prerequisite: Genetics 103 and 105 or consent of instructor. Topics of current interest relating genetics to problems of populations, ecology, and behavior. Offered in even-numbered years.

298. Group Study (1-5) I, II, III. Members of the Group (Chairperson in charge)
Prerequisite: consent of instructor. Directed group study of special topics in genetics. (S/U grading only.)

299. Research (1-12) I, II, III. Members of the Group (Chairperson in charge)
(S/U grading only.)

Geography

(College of Letters and Science)

Marlyn L. Shelton, Ph.D., Chairperson of the Department

Department Office, 280 Kerr Hall (752-0792)

Faculty

Conrad J. Bahre, Ph.D., Associate Professor
[2 3]Dennis J. Dingemans, Ph.D., Associate Professor
[3]Deborah L. Elliott-Fisk, Ph.D., Assistant Professor
Howard F. Gregor, Ph.D., Professor
Louis E. Grivetti, Ph.D., Associate Professor (Geography, Nutrition)
[4]Stephen C. Jett, Ph.D., Professor
Marlyn L. Shelton, Ph.D., Associate Professor
[4]Frederick J. Simoons, Ph.D., Professor
[2]Kenneth Thompson, Ph.D., Professor

The Major Program

Geography is a multifaceted discipline which strives to understand the human and physical systems of our global environment and their interaction. Knowledge of the physical processes which shape our natural environment and of the human processes that have led to different cultural patterns and landscapes is especially valuable in understanding the diverse spatial organization of our world. The curriculum for the major permits students to pursue a program of study compatible with individual needs, interests, and objectives. In the Bachelor of Arts program, the student may choose the general emphasis or a specialization in cultural/historical, economic/urban, physical, or regional planning and analysis. The Bachelor of Science program is for students with a strong science background interested in some aspect of physical geography. Both degree programs include opportunities for developing skills in cartography, field techniques, quantitative methods, and remote sensing and are planned in consultation with the major adviser.

The major in Geography provides training for students interested in careers in business, government, elementary and secondary education, and regional planning. The undergraduate program is especially suitable for students who wish to pursue graduate study leading toward professional careers in geography.

Geography

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**12**
Geography 1, 2, and 5	12
Depth Subject Matter	**40-44**
Geography 105 or 106, plus 151, and at least one UCD regional course from Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, 127	12
Choose one emphasis from the following five:	
Emphasis I (General)	28
One course from each of the following three groups: a. Geography 170 and 171 b. Geography 141 and 155 c. Geography 108 and 115 Four additional upper division geography courses.	
Emphasis II (Cultural/Historical)	28
Geography 170, 171, plus one course from 108, 115, 141, 155. Four additional courses chosen from Geography 110, 143, 152, 172, 173, 175.	
Emphasis III (Economic/Urban)	28
Geography 110, 141, 155, plus one course from 108, 115, 170, 171 Three additional courses chosen from Geography 104, 142, 143, 156, 161, 162.	
Emphasis IV *(Physical)*	30
Geography 3, 108, 110, 115, 162, 173, plus one course from 141, 155, 170, 171. One additional course from Geography 102, 112, 117, 161.	
Emphasis V (Regional Planning and Analysis)	31-32
Geography 155 or 156, 110, plus one additional course from 121-127, and one course from 142, 161, 162, 170, 173. Environmental Planning and Management 110, and 134 or Environmental Studies 171, plus Political Science 107 or Environmental Studies 161, plus one course from Economics 115A, Agricultural Economics 148, or Geology 134.	
Total Units for the Major	**52-56**

Recommended: Geography 4.

Geography

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**56-60**
Geography 1, 2, 3, and 5	15
Statistics 13 or the equivalent	4
Mathematics 16A, 16B, and 16C; or Mathematics 21A, 21B, and 21C	9-12
Computer Science Engineering 8 or 20	3
Chemistry 1A-1B-1C or 4A-4B-4C	15
Biological Sciences 1	5
Zoology 2-2L or Botany 2 or Geology 60-60L or Physics 2A-2B	5-6
Depth Subject Matter	**43-45**
Geography 105, 106, 108, 115, 151	20
Two courses from Geography 110, 112, 117, 162, 173	7-8
One course from Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126	3-4
Four additional upper division, letter-graded units in Geography	4
Nine additional upper division units chosen in consultation with undergraduate adviser	9
Total Units for the Major	**99-105**

Recommended
Geography 4; Physics 8A-8B-8C; Chemistry 8A, 8B.

Addendum
The B.S. major provides a wide diversity of possible themes, including geomorphology, climatology, zoogeography, plant geography, nutritional geography; water-resource studies; and mathematical geography. An individual's program may emphasize one or more of these themes and is planned in consultation with the major adviser.

Minor Program Requirements:

Letters and Science students who do not major in Geography may satisfy the requirements for a minor in the field by successfully completing the minimum units as follows:

	UNITS
Geography	**20**
Upper division units in geography chosen in consultation with major adviser	20

Major Adviser. See *Class Schedule and Room Directory.*

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, Jett; II, Jett; III, Elliott-Fisk
Lecture—3 hours; laboratory—2 hours. Basic physical elements of the human habitat, especially climate, landforms, soils, and natural vegetation.

2. Introduction to Cultural Geography (4) I, II. Simoons
Lecture—4 hours. Traditional systems of habitat use: their characteristics, origin, occurrence, ecology. Development of contemporary cultural patterns and problems in man-land relationships. Emphasis on the nonindustrial world.

3. Climate and Weather (4) I, III. Shelton
Lecture—3 hours; discussion—1 hour. Basic concepts of climate and weather; energy and moisture exchanges, atmospheric pressure, global circulation and winds; instruments for obtaining climatological data; weather maps; severe storms; global, regional, and local climate and weather; climatic change; climate of California.

4. Maps and Map Interpretation (3) I, Bahre
Lecture—3 hours. Properties and components of maps. Major classes of projections. Types of maps, emphasizing relief, cadastral, thematic, and modern trends in mapping. History and development of cartography.

5. Introduction to Urban and Economic Geography (4) I, Gregor; III, ———
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. Human Impacts on the Landscape (4) II. Thompson
Lecture—4 hours. Man's influence on world geography and ecology. The effects of human occupance and activities on the environment, especially the landscape.

***7. Problems in Regional Ecology** (4) II. Simoons
Lecture—4 hours. Selected historical and contemporary

NOTE: For key to footnote symbols, see page 123.

ecological problems from various parts of the world. Emphasis on interaction between cultural and physical environments. Regions selected from areas of faculty specialization.

10. The World's Regions (3) I, Jett; III, Dingemans
The major geographic regions of the world; their origins, physical environments, cultures and economies; their interactions and global roles. Designed for non-majors.

***50. Geography and Environmental and Regional Planning** (3) III. Dingemans
Lecture—3 hours. Principles of spatial planning for regional change. Policies for environmental, economic, and social modifications. Illustrated case studies include: U.S. city planning, USSR industrial and population shifts, European regional plans, Chinese agricultural and environmental programs.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Independent Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

***102. Field Course in Physical Geography** (4) III. Elliott-Fisk
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.

***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) I, Elliott-Fisk
Lecture—1 hour; laboratory—8 hours. Prerequisite: course 4 or consent of instructor. Compilation and generalization of base-map data; symbolization and processing of map data; cartographic design and lettering techniques; map reproduction.

106. Aerial Photo Interpretation and Remote Sensing (4) III. Bahre
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 1 or consent of instructor. Basic photogrammetry, sensors and platforms, aerial photo interpretation, and remote sensing applications.

107. Advanced Cartography (4) II. Bahre
Lecture—1 hour; laboratory—8 hours. Prerequisite: course 105. Advanced principles and techniques of cartographic representation. Emphasis on scribing, plate making, process photography, color separation, and color proofing. Use of contemporary cartographic and photographic equipment utilized in producing maps. Offered in even-numbered years.

108. Analysis of Landforms (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Introduction to landforms and geomorphic processes. Topics include structural landforms, rock weathering and soil genesis, hillslope processes, and fluvial, glacial and coastal landscapes.

110. Quantitative Spatial Analysis (4) II.
Lecture—3 hours; term paper. Prerequisite: course 1, 2, or 5 and Statistics 13 or 102 recommended. Methods for geographic research and location planning; quantitative summary and analysis of spatial data patterns and trends; optimal location solutions; includes correlation, regression, and use of pre-packaged computer programs.

112. Coastal Landforms and Landscapes (4) III. Elliott-Fisk
Lecture—3 hours; discussion—1 hour. Prerequisite: course 108 or consent of instructor. Examination of the landforms and geomorphic processes found at coasts. Analyses of coasts in a variety of lithologic, tectonic, and "wave climate" settings. Emphasis on the Quaternary history of coastal landscapes. Offered even-numbered years.

115. Mesoclimatology (4) II. Shelton
Lecture—3 hours; term paper. Prerequisite: course 3. Examination of areal energy and moisture exchanges at the earth-atmosphere interface: physical controls, spatial and temporal variations, measuring and modeling the exchange processes, classification of mesoclimates. Climate and related processes in areal systems. Man's alteration of mesoclimates.

***116. Climate Change** (4) II. Elliott-Fisk, Shelton
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 3. Nature, magnitude, timing, and causes of climate change. Spatial and temporal climatic variations within the Quaternary emphasized. Offered in even-numbered years.

117. Quaternary Environments (3) I, Elliott-Fisk
Lecture—3 hours. Prerequisite: course 1, or Biological Sciences 1 or consent of instructor. Introduction to character, timing and magnitude of environmental changes during the Quaternary (Pleistocene and Holocene). Analysis of methods of paleo-environment identification. Survey of Quaternary record for selected regions.

***119. Arid Lands** (4) 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) II. Gregor
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Landscapes and lifeways in the United States and Canada, and the ways in which physical and human forces have contributed to their variety. Regional stresses within and between the two countries.

122A. Mexico and Central America (4) I, Bahre
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy from Mexico to Panama and in the Caribbean. Emphasis on understanding the evolution of the diverse natural and cultural landscapes of Middle America. Approach will be cultural-historical and ecological. Offered in even-numbered years.

***122B. South America** (4) III. Bahre
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy in the South American countries. Emphasis on understanding the evolution of the diverse natural and cultural landscapes of South America. The approach will be cultural-historical and ecological. Offered in even-numbered years.

123. Western Europe (3) II. Thompson
Lecture—3 hours. Prerequisite: courses 1 and 2 or consent of instructor. Geographic conditions and their relation to the economic, social and political problems of the countries of Western Europe.

***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—4 hours. Prerequisite: courses 1 and 2 or consent of instructor. Geography of the Islamic world of North Africa and Southwest Asia; climatic and physical features; cultural areas, settlement patterns, and the influence of Islam; economic patterns and development.

***125B. Sub-Saharan Africa** (4) II. Simoons
Lecture—4 hours. Prerequisite: courses 1 and 2 or consent of instructor. Physical, cultural, and historical geography of Africa south of the Sahara.

***126. Southern Asia** (4) II. Simoons
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2, or consent of instructor. Physical, cultural, and historical geography of Southern Asia.

***127. Geography of Contemporary China** (3) III. Dingemans
Lecture—3 hours. Prerequisite: course 1 and 2 or consent of instructor. A review of physical and human environments in China. The location of resources, agriculture, industry, and cities. The contemporary socioeconomic system as it modifies traditional rural and urban landscapes. Analysis of China as one model of economic development.

131. California (4) III. Gregor
Lecture—3 hours; discussion—1 hour. The regional nature and variety of California: landforms, climates, vegetation, and soils; water, agriculture, and the cities. Ecological problems caused by increasing population and technological pressures on these environments.

***141. Organization of Economic Space** (4) II. Gregor
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Survey of the principal environmental, social, political, and cultural forces contributing to the regionalization of the world's economic activities. Outline of the more important regional patterns resulting from the interplay of these forces. Emphasis will also be put on these aspects as they pertain to the problems of regional disparities both within and between nations.

142. Geography of Agriculture (4) II. Gregor
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Distribution and areal variety of the world's food-producing areas, and the ways physical, economical, cultural, and historical factors have influenced these aspects of agriculture. Current and future trends and associated resource problems.

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, Simoons
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.

155. Urban Geography (4) III.
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) III. Dingemans
Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Location and functional interdependence of cities. Relations between city and hinterland, including labor shed, service area, and economic base. Role of urbanization in regional development.

160. World Resource Patterns (3) III. Gregor
Lecture—3 hours. Prerequisite: upper division standing. Principal world patterns of resource distribution. Concentrations and voids, and their significance for economic development and the welfare of the state. Focus on both natural and human resources of the geographic complex. Resource status of main economic regions.

161. Conservation of Resources and Environment (4) II. 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) II. Shelton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Geographical survey of water on the land: needs and opportunities for water-resource development and conservation. Historical solutions to water needs of specific areas, and geographical problems associated with current and future water requirements.

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—4 hours. Prerequisite: course 2 or consent of instructor. Consideration of the principal approaches to cultural geography in modern times, including environmental determinism and possibilism, regional geography, cultural history, cultural ecology, and environmental perception.

***172. Animals and Culture History** (4) I, Simoons
Lecture—4 hours. Prerequisite: course 2, Anthropology 2, or consent of instructor. Theories of animal domestication; spread of domesticated animals in Old and New Worlds; contrasting roles of domesticated animals in human ecology through time; pastoral nomadism and other animal-based economies.

173. Humans and Vegetation Change (4) III. Bahre
Lecture—3 hours; term paper. Prerequisite: course 1 or Biological Sciences 1, or consent of instructor. Role of humans in modifying the earth's vegetation. Emphasis on cultural plant geography, factors of plant distribution, classification and mapping of vegetation, world vegetation patterns, human impact on major regions and case studies of land use and vegetation change.

175. Geography of Food and Diet (4) II. Grivetti
Lecture—4 hours. Prerequisite: course 2 or Anthropology 2, Nutrition/Food Science and Technology 20 recommended. Consideration of the cultural and environmental factors that influence dietary practices; historical development of food habits; food use in different economic systems, both traditional and contemporary. Offered in odd-numbered years.

192. Student Internship in Geography (2-4) I, II, III. The Staff
Internship—5-15 hours at employing agency; term paper. Prerequisite: consent of an undergraduate Geography adviser and consent of instructor. Supervised program of student internships with public agencies dealing with geographical problems. The application and evaluation of theoretical concepts through work experience with a variety of assignments and work schedules. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates. (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

Graduate Courses

200. Research Trends in Geography (1) I. The Staff (Chairperson in charge)
Seminar—1 hour. Major current research themes and trends in geography. (S/U grading only.)

201. Sources and General Literature of Geography (4) I, II, III. The Staff
Discussion—4 hours. Prerequisite: graduate status in geography; consent of instructor. Designed for students preparing for higher degrees in geography. May be repeated for credit in one or more of the following subfields: physical, cultural, economical, urban, historical, political, conservation, and regional geography.

***290. Seminar: Selected Regions** (4) III. Bahre
Seminar—3 hours. Region to be announced annually.

291. Seminar in Cultural Geography (4) II. Simoons
Seminar—3 hours.

***293. Seminar in Political Geography** (4) III. Thompson
Seminar—3 hours.

294. Seminar in Climatology (4) I, Shelton, Elliott-Fisk
Seminar—3 hours.

295. Seminar in Urban Geography (4) III. Dingemans
Seminar—3 hours.

***296. Seminar in Agricultural Geography** (4) II. Gregor
Seminar—3 hours.

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299D. Individual Study (1-12) I, II, III. The Staff
Prerequisite: graduate student status in Geography and consent of instructor. (S/U grading only.)

Geology

(College of Letters and Science)

_____, Chairperson of the Department

Department Office, 175 Physics-Geology Building

Faculty

Richard Cowen, Ph.D., Professor
Howard W. Day, Ph.D., Associate Professor
James A. Doyle, Ph.D., Professor *(Botany)*
Cordell Durrell, Ph.D., Professor Emeritus
Anthony A. Finnerty, Ph.D., Assistant Professor
Harry W. Green II, Ph.D., Professor
Charles G. Higgins, Ph.D., Professor
Jere H. Lipps, Ph.D., Professor
Stanley V. Margolis, Ph.D., Professor
Robert A. Matthews, A.B., Lecturer
James S. McClain, Ph.D., Assistant Professor
Eldridge M. Moores, Ph.D., Professor
Jeffrey F. Mount, Ph.D., Assistant Professor
Dennis R. Ojakangas, Ph.D., Lecturer
Peter Schiffman, Ph.D., Adjunct Lecturer
Philip W. Signor, Ph.D., Adjunct Lecturer
Bruce E. Taylor, Ph.D., Assistant Professor
Bennie W. Troxel, M.A., Lecturer
Robert J. Twiss, Ph.D., Associate Professor
Kenneth L. Verosub, Ph.D., Associate Professor
Peter D. Ward, Ph.D., Associate Professor

The Major Programs

Students interested in becoming professional geologists or continuing their geological studies at the graduate level should elect the program leading to the Bachelor of Science degree. The Bachelor of Arts degree program is designed for those students for whom the program serves as part of an interdisciplinary course of studies. In either program additional courses may be elected for emphasis in physical or environmental geology or paleontology.

High School students should note that the preparation for either program requires high school chemistry and four years of mathematics or the equivalent. Transfer students will be admitted into the B.S. degree program only after completion of the equivalent of Chemisty 1A-1B-1C or one year of physics, Mathematics 21A-21B-21C, and a course in physical geology with laboratory or mineralogy with laboratory, with an overall average grade of C or better.

Geology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**41-42**
Chemistry 1A-1B or 4A-4B	10
Geology 50, 50L, 60, 60L	10
Mathematics 16A-16B-16C or 21A-21B	8-9
Physics 2A-2B-2C	9
Zoology 2 or Geology 3-3L	4
Depth Subject Matter	**39**
Geology 102, 105, 105L, 106, 106L, 107, 107L, 122, 123, 124	34
Additional upper division units in geology and related fields approved by the major adviser	5
Total Units for the Major	**80-81**

Recommended
Chemistry 1C or 4C; Geology 2, 2L, 3, 3L; Physics 3A, 3B, 3C; Statistics 13 or 102.

Geology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**56**
Chemistry 1A-1B-1C; or preferably 4A-4B-4C	15
Geology 50, 50L, 60, 60L	10
Mathematics 21A, 21B, 21C	12
One course chosen from the following group: Mathematics 22A, 22B, 22C, Statistics 32, 102	3
Physics 8A-8B-8C, or 2A-2B-2C and 3A-3B-3C	12
Zoology 2 or Geology 3-3L	4
Depth Subject Matter	**54**
Geology 102, 105, 105L, 106, 106L, 107, 107L, 108, 108L, 118, 122, 123, 124, 125	52
Geology 190 (repeat course at least once)	2
Total Units for the Major	**110**

Recommended
Geology 2, 2L, 3, 3L; Statistics 13.

One or more of the following courses, depending on emphasis in geology: Mathematics 22A, 22B, 22C; Statistics 104, 106, 108, 110.

Major Advisers. C.G. Higgins (A.B. degrees); C.G. Higgins, R.A. Matthews, R.J. Twiss (B.S. degrees).

Minor Program Requirements:

Students in other disciplines may elect to complete a minor in Geology by choosing one of the geological subject emphases listed below. On transcripts the minor will appear as a minor in *Geology*.

	UNITS
Geology	**19-24**

	UNITS
Economic emphasis	**21-23**
Geology 115, 117A, 117B, 120, 130, 170	18
One course chosen from Economics 123, Engineering 160, Geology 152, 180, 181	3-5

Minor Adviser. B. E. Taylor.

	UNITS
Engineering emphasis	**20-21**
Civil Engineering 171, 172	5
Geology 117A, 117B, 134, 175	12
Soil Science 118 or 120-120L	3-4

Minor Adviser. R. A. Matthews.

	UNITS
Environmental emphasis	**23-24**
Geology 130, 134, 152, 175	13
Soil Science 118	4
Water Science 141 or Civil Engineering 142	3
One course chosen from Environmental Studies 160, 171, 179, Geology 154	3-4

Minor Adviser. R. A. Matthews.

	UNITS
Geochemistry emphasis	**22-24**
Chemistry 110A, 110C (Chemistry majors must substitute one of the elective courses for Chemistry 110C.)	6
Geology 60, 60L, 115, 180	13
One elective course chosen from Chemical Engineering 151, Chemistry 126, Engineering 130, 134, Geology 150A, Soil Science 102, Water Science 180	3-5

Minor Adviser. B. E. Taylor.

	UNITS
Geomorphology emphasis	**20-21**
Geology 106, 134, 152, 153	14
Soil Science 120, 120L	3
At least one course chosen from Civil Engineering 171, Geography 112, 117, Geology 154, Soil Science 121	3-4

Minor Adviser. C. G. Higgins.

	UNITS
Geophysics emphasis	**21-24**
Geology 117A, 117B, 181	9
Applied Science Engineering 115	3
One course sequence chosen from the following	9-12
(a) Atmospheric Science 120, 121A, 121B;	
(b) Electrical and Computer Engineering 112, 151, 161;	
(c) Geology 105, 162, Physics 105C;	
(d) Mathematics 128A, 128B, 128C	
(e) Physics 104A, 104B, 105C.	

Minor Adviser. J. S. McClain.

	UNITS
Oceanography emphasis	**19-24**
*Geology 106, 116, 150A, 150B, 150C	16
One course chosen from Environmental Studies 100, 151, Geology 111A, 111B, S119, Water Science 180	3-8

Minor Adviser. P. D. Ward.

	UNITS
Paleobiology emphasis	**20-24**
Botany 140	4
Geology 107, 107L, 111A, 111B	13
At least one course chosen from Anthropology 152, Botany 142, 143, Genetics 103, Geology 138, 150C, S119, Zoology 112, 125, 147, 148, 149	3-7

Minor Adviser. P. D. Ward.

Teaching Credential Subject Representative. C. G. Higgins. See page 98 for the Teacher Education Program.

Graduate Study. The Department of Geology offers a program of study and research leading to the M.S. and Ph.D. degrees. For information regarding graduate study in geology, address the Graduate Adviser, Department of Geology.

Graduate Advisers.

R. Cowen, P. D. Ward.

Courses in Geology

Lower Division Courses

1. The Earth (3) I, Ward: III, Higgins
Lecture—3 hours. Introduction to geology for those not majoring in geology or associated sciences. Constitution of the Earth and the internal and external processes that form and change it. Not open for credit to students who have taken course 50.

1L. Earth Laboratory (1) I, Ward; III, Higgins
Laboratory—3 hours. Prerequisite: course 1 (preferably taken concurrently). Introduction to Earth materials (minerals and rocks), crustal deformation (faults and folds), landforms, and the processes that form them. Not open for credit to students who have taken course 50L.

NOTE: For key to footnote symbols, see page 123.

***2. Landforms** (3) II. Higgins
Lecture—3 hours. Prerequisite: course 1 recommended. Landforms and landscapes—the sculpture of the Earth's surface by natural processes.

***2L. Landforms Laboratory** (1) II. Higgins
Laboratory—3 hours. Prerequisite: courses 1L and 2 (preferably taken concurrently). How to study and interpret landforms geologically; an introduction to some of the geomorphologist's tools—maps, models, aerial photographs, and the landscape around us.

3. History of Life (3) II. Cowen
Lecture—3 hours. Prerequisite: course 1 recommended. The history of life during the three and one-half billion years from its origin to the present day. Origin of life and processes of evolution; how to visualize and understand living organisms from their fossil remains.

3L. History of Life Laboratory (1) II. Cowen
Laboratory—3 hours. Prerequisite: course 3 (concurrently). Exercises in understanding fossils as the clues to interpreting ancient life, including their functional morphology, paleoecology, and evolution.

16. The Physical Earth and Man (3) III. Matthews
Lecture—24 hours; discussion—4 hour. The problem of non-renewable natural resources. Their role in technology and society; their availability, rates of depletion, and the probable impact on society of their exhaustion.

17. Earthquakes and other Earth Hazards (2) I, Verosub
Lecture—2 hours. The impact of earthquakes, volcanoes, landslides and floods on Man, his structures and his environment. Discussion of the causes, effects, and solution of geologic problems in rural and urban settings.

20. Geology of California (2) II. Matthews
Lecture—2 hours; demonstration—1 hour. The geologic history of California, the origin of rocks and the environments in which they were formed, the structure of the rocks and the interpretation of their structural history, mineral resources, and appreciation of the California landscape.

50. Physical Geology (3) II. Twiss
Lecture—3 hours. Prerequisite: high school physics and chemistry. The Earth, its materials, its internal and external processes, its development through time by sea-floor spreading and global plate tectonics. Students with credit for course 1 or the equivalent may receive only 2 units for course 50.

50L. Physical Geology Laboratory (2) II. Twiss
Laboratory—6 hours; one or two one-day field trips. Prerequisite: course 50 (preferably taken concurrently). Introduction to classification and recognition of minerals and rocks and to interpretation to topographic and geologic maps and aerial photographs. Students with credit for course 1L or the equivalent may receive only 1 unit for course 50L.

60. General Mineralogy (3) III. Finnerty
Lecture—3 hours. Prerequisite: Chemistry 1A or 4A. Crystallography; physical and chemical structure and properties of minerals; mineral genesis.

60L. General Mineralogy Laboratory (2) III. Finnerty
Laboratory—6 hours. Prerequisite: course 60 (preferably taken concurrently). Morphological crystallography; stereographic projection; identification of the common rock-forming minerals.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

102. Field Geology (5) III. Matthews, Troxel
Lecture—1 hour; laboratory—2 hours; field study—8 full days. Prerequisite: courses 105L, 106L, 123; 124 (may be taken concurrently); course 125 recommended. Instruction in geologic mapping techniques; field geologic study of selected areas to expose students to a variety of geologic features. A geologic map, cross-section stratigraphic section and description of geologic rock units is required (30 hours minimum).

105. Structural Geology (3) I, Twiss
Lecture—3 hours. Prerequisite: courses 50-50L; Physics 2A or 8A. Recommended: Mathematics 21A, 21B. Description and origin of the deformational features of the earth's crust. Brittle deformation, stress, faults and fractures; ductile deformation, strain, folds and foliations. Experimental rock deformation.

105L. Structure Geology Laboratory (2) I, Twiss
Lecture—1 hour; laboratory—2 hours; two or three one-day field trips and reports. Prerequisite: course 105 (concurrently), high school trigonometry and geometry. Graphical solutions to structural problems, introduction to field methods and field mapping, interpretation of geologic maps.

106. Ancient Environments (3) II. Margolis
Lecture—3 hours. Prerequisite: course 50, background in sedimentology, or consent of instructor. Study of modern and ancient environments; processes and geologic records of mountains, plains, coasts, shallow seas, and deep oceans. Ecology and the fossil record as a key to past environments; introduction to stratigraphic principles and methods.

106L. Ancient Environments Laboratory (2) II. Margolis
Laboratory—6 hours; two or three one-day field trips. Prerequisite: courses 50L, 106 (preferably taken concurrently). Introduction to stratigraphic procedures, identification of environmentally diagnostic rocks and fossils, problems of making geologic maps, recognition of ancient environments in the field.

107. Principles of Paleobiology (3) III. Cowen, Lipps
Lecture—3 hours. Prerequisite: courses 3-3L or Zoology 2. The evolution and ecological structure of the biosphere from the origin of life to the present, with special emphasis on the oceanic environment during the last 600 million years.

107L. Principles of Paleobiology Laboratory (2) III. Cowen, Lipps
Laboratory—6 hours. Prerequisite: courses 3-3L or Zoology 2; course 107 (concurrently). Exercises in determining the ecological functions and evolution of individuals, populations, and communities of fossil organisms in field and laboratory.

108. Regional Structure and Stratigraphy (3) I, Moores
Lecture—3 hours. Prerequisite: courses 105, 105L, 106, 106L. Global tectonic features and processes. Structure, stratigraphy, and evolution of large-scale features of the earth's crust; shield and platforms, continental margins, ocean basins, plate boundaries and mountain belts.

108L. Regional Structure and Stratigraphy Laboratory (2) I, Moores
Laboratory—6 hours; two one-day field trips. Prerequisite: course 108 (preferably taken concurrently). Illustration of topics covered in course 108. Emphasis on the interpretation of geologic history using geologic maps selected from a variety of structural and stratigraphic provinces.

111A. Paleobiology of Invertebrata (4) I, Cowen
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of the major phyla of invertebrates.

111B. Paleobiology of Protista (4) II. Lipps
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 107. Morphology, systematics, evolution, and ecology of single-celled organisms.

113. The Solar System (3) II. Verosub
Lecture—3 hours. Prerequisite: one course in physical science. Nature of the Sun, Moon and planets as determined by recent manned and unmanned exploration of the solar system. Comparison of terrestrial, lunar and planetary geologic processes. Search for life. Origin and evolution of the solar system.

115. Geochemistry (3) III. Taylor
Lecture—3 hours. Prerequisite: Chemistry 1A (may be taken concurrently); course 50. Application of principles of solution, physical, structural, colloidal, and isotopic chemistry to geologic problems. Formation of carbonate rocks and other chemical sediments, rock weathering, and clay mineral formation. Magmatic, metamorphic, and hydrothermal processes and radiometric dating techniques.

116. The Oceans (3) II. Ward, Powell (Environmental Studies)
Lecture—3 hours. Prerequisite: upper division standing or consent of instructor. Introductory survey of the marine environment. Oceanic physical phenomena, chemical constituents, geological history, and the sea's biota; man's utilization of marine resources. (Same course as Environmental Studies 116.)

117A. Geophysics: Gravity and Magnetics (3) II. Verosub
Lecture—3 hours; field experience with geophysical instruments. Prerequisite: Physics 8B and Mathematics 21C or consent of instructor. Introduction to the use of physics in the study of earth structures and processes: gravity, paleomagnetism, geomagnetism. Application to geophysical exploration as well as solid earth geophysics.

117B. Geophysics: Seismology and Heat Flow (3) I, McClain
Lecture—3 hours; field experience with geophysical instruments. Prerequisite: Physics 2C or 8C and Mathematics 21C or consent of instructor. Introduction to the use of physics in the study of earth structures and processes: seismology, heat flow. Application to geophysical exploration as well as solid earth geophysics.

118. Summer Field Geology (8) Extra-session summer. The Staff
Six weeks in field. Prerequisite: course 102. Preparation of a geologic map and report on a selected field area.

***120. Opaque Optical Mineralogy: Ore Microscopy** (2) II. Taylor
Lecture—1 hour; laboratory—3 hours. Prerequisite: courses 60 and 60L. Introduction to the techniques used to identify opaque minerals. Offered in even-numbered years.

122. Optical Mineralogy (4) I, Green
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 60, 60L or consent of instructor. Optical properties of crystals and techniques of mineral identification with the petrographic microscope.

123. Igneous Petrology (5) II. Finnerty
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122. Origin and occurrence of igneous rocks. Laboratory exercises emphasize the study of these rocks in hand specimen and thin section.

124. Sedimentary Petrology (5) III. Mount
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122. Origin and occurrence of sedimentary rocks. Laboratory exercises emphasize the study of these rocks in hand specimen and thin section.

125. Metamorphic Petrology (5) I, Day
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122; course 123 recommended. Occurrence and origin of metamorphic rocks. Laboratory exercises emphasize the study of these rocks in hand specimen and thin section.

130. Non-Renewable Natural Resources (3) I, Matthews
Lecture—3 hours. Prerequisite: course 1 or 16. Origin, occurrence, and distribution of non-renewable resources, including metallic nonmetallic, and energy-producing materials. Problems of discovery, production, and management. Estimations and limitations of reserves, and their sociological, political and economic effects.

134. Environmental Geology and Land Use Planning (3) II. Matthews
Lecture—3 hours. Geologic aspects of land use and development planning. Problems concerning waste disposal, land stability, earthquake prediction. Analytic techniques, presentation of reports, and legal aspects of selected case studies.

138. Seminar in Stratigraphic Paleontology (3) III. Ward
Lecture—1 hour; seminar—2 hours. Prerequisite: courses 3, 3L, 106, and 106L. Introduction to zone and range concepts, geologic time, and pertinent aspects of codes of stratigraphic and zoological nomenclature. Participants analyze major evolutionary developments within animal, protistan and plant phyla as keys to geological age determinations.

140. Geologic Data Collection and Report Presentation (2) III. Troxel
Lecture—2 hours. Prerequisite: upper division standing and a major in Geology. Collection, organization and presentation of data for geologic reports. Participants will analyze published reports, write syntheses of published reports and write abstracts.

145. Paleoecology (3) II. Ward
Lecture—3 hours. Prerequisite: course 107. Principles and methods of environmental reconstruction of ancient animal and plant communities. Course includes statistical methods in paleoecology; principles of biostratigraphy.

146. Evolutionary Paleontology (3) I, Lipps, Cowen
Lecture—3 hours. Prerequisite: course 107. Principles of evolution from the special perspective of the fossil record. Facts and inferences on the origin of species and higher taxa. Survey of adaptive radiations and major extinctions.

150A. Physical and Chemical Oceanography (4) I, Powell (Environmental Studies)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 or Environmental Studies 116; Physics 8C; Mathematics 22C; Chemistry 1C; or upper division standing in a natural science and consent of instructor. Physical and chemical properties of seawater, fluid dynamics, air-sea interaction, currents, waves, tides, mixing, major oceanic geochemical cycles. (Same course as Environmental Studies 150A.)

150B. Geological Oceanography (3) II. Margolis
Lecture—3 hours. Prerequisite: course 50 or 116. Introduction to the origin and geologic evolution of ocean basins. Composition and structure of oceanic crust; marine volcanism; and deposition of marine sediments. Interpretation of geologic history of the ocean floor in terms of sea-floor spreading theory. (Same course as Environmental Studies 150B.)

150C. Biological Oceanography (3) III. Ward, Powell (Environmental Studies)
Lecture—3 hours. Prerequisite: Biological Sciences 1 and a course in general ecology or consent of instructor. Survey of the ecology of major marine habitats including intertidal, shelf benthic, deep-sea, and plankton communities. Existing knowledge and contemporary issues in research will be equally stressed. A portion of the course will be devoted to man's use of and impact on the ocean. (Same course as Environmental Studies 150C.)

152. Photogeology and Remote Sensing (4) II. Higgins
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1L or 2L or 50L; course 105 recommended. Field use of aerial photographs; types and availability, stereoviewing, and basic geometry. Geological uses and interpretation of aerial photographs and of images obtained by remote sensing.

NOTE: For key to footnote symbols, see page 123.

153. Geomorphology (4) I, Higgins
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 50-50L or 1-1L; courses 2-2L or Geography 1 recommended. Landforms, landscapes, and the processes that shape them. An introduction to geomorphic observation and theory. Alternates with and complements course 154. Offered in even-numbered years.

***154. Environmental Geomorphology** (3) I, Higgins
Lecture—3 hours. Prerequisite: courses 50-50L or 1-1L; courses 2-2L or Geography 1 recommended. Aspects of geomorphology that relate to Man's use of the natural environment. Alternates with and complements course 153. Offered in odd-numbered years.

162. Stress and Deformation (4) I, Green
Lecture—3 hours; discussion—2 hours. Prerequisite: Mathematics 21C and Physics 8C; Mathematics 22A, 22C, and Physics 8B recommended. Introduction to tensor analysis: tensor notation transformations, representation quadric, Mohr-circle construction; stress, strain; strain-rates, elasticity. Solution of general, three-dimensional problems with geological application.

165. Seismic Stratigraphy (3) III. McClain
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 106, 117A, 117B, or consent of instructor. Seismic stratigraphy as an exploratory tool. Obtaining and processing seismic reflection data. Sound propagation in sediments. Interpretation and analysis of seismic records. Relationships between seismic data and depositional environments.

170. Geology of Ore Deposits (4) I, Taylor
Lecture—3 hours; laboratory—3 hours; four-day field trip (including weekend). Prerequisite: courses 60-60L and 105L. Examination of major metallic ore-types using principles of plate tectonics, structural geology, petrology, and geochemistry. Laboratory study of selected ore deposits.

175. Introduction to Geological Engineering (3) III. Shen (Civil Engineering), Matthews
Lecture—2 hours; laboratory—3 hours. Prerequisite: junior standing. Introduction to the principles of geology, and study of geologic features that affect engineering structures. Discussion of geological aspects of engineering construction problems by means of case history studies. (Same course as Civil Engineering 175.)

180. Instrumental Analysis (5) III. Schiffman
Lecture—3 hours; laboratory—6 hours. Prerequisite: elementary chemistry and elementary physics. Theory of the generation and detection of x-rays as applied to the determination of crystal structures and the analytical chemistry of rocks, minerals, and other compounds. Laboratory sessions will be given on use of the x-ray diffractometer and electron microprobe both as a scanning electron microscope and analytical tool.

181. Geologic Applications of Computers (3) I, Ojakangas
Lecture—2 hours; laboratory—3 hours. Prerequisite: upper division standing and one upper division geology course or consent of instructor. Introduction to solution of geological and paleobiological problems by computer methods.

185. Advanced Field Geology (1-6) I, II, III. The Staff
Fieldwork—3-18 hours; report. Prerequisite: course 118 or graduate standing in Geology. Advanced problems and methods in geologic field studies; preparation of a geologic report. May be repeated for total of 6 units when different subject matter studied.

190. Seminar in Geology (1) I, II, III. The Staff
Discussion—1 hour; seminar—1 hour. Prerequisite: major in Geology. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. May be repeated for credit. (P/NP grading only.)

192. Internship in Geology (1-12) I, II, III. The Staff (Chairperson in charge)
Work-learn experience. Prerequisite: upper division standing; project approval prior to internship. Supervised work-learn experience in geology. May be repeated for credit for a total of 10 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: senior standing in geology or consent of instructor.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

206. Stratigraphic Analysis (3) III. Mount
Lecture—3 hours. Prerequisite: courses 105L and 106L or consent of instructor. Advanced historical geology; analysis of stratigraphy and geologic history of North America and selected parts of other continents. Emphasis on interpreting lithologic assemblages and stratigraphic relations in terms of modern tectonic-depositional models.

***209. Origin and Significance of Metamorphic Textures** (4) II. Green
Seminar—3 hours; laboratory—3 hours. 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. Topics change from year to year. May be repeated three times for credit.

214. Seminar in Quaternary Geology and Geomorphology (2) III. Higgins
Seminar—1 hour; field trip(s)—approximately 10 hours. Presentation of preliminary research reports, review and discussion of selected papers on Quaternary geologic and geomorphic studies. At least one full day in field. May be repeated for credit. (S/U grading only.)

215. Advanced Geochemistry (3) II. Taylor
Lecture—3 hours. Prerequisite: course 115, Chemistry 110A or consent of instructor. Principles and applications of nuclear chemistry to geology: radiogenic and stable isotope geochemistry. Trace element geochemistry. Topics covered include age and origin of earth materials, geothermometry, paleoclimates, and applications to the study of earth processes.

216. Tectonics (3) II. Moores
Seminar—3 hours. Prerequisite: course 108 or consent of instructor. Nature and evolution of tectonic features of the Earth. Causes, consequences, and evolution of plate motion, with selected examples from the Earth's deformed belts.

217. Topics in Geophysics (3) II. McClain
Lecture—1 hour; seminar—2 hours. Prerequisite: consent of instructor. Discussion and evaluation of current research in a given area of geophysics. Topic will change from year to year. May be repeated for credit.

***218A. Structural Analysis I: Macrofabrics** (3) II. Twiss
Seminar—3 hours. Prerequisite: consent of instructor. Geometric and kinematic analysis and interpretation of mesoscopic and macroscopic geologic structures and fabrics; geometry of folding, superposed folding, and folded lineations; symmetry arguments in the interpretation of fabrics; determination of slip lines of deformation; regional structural synthesis. Offered in odd-numbered years.

218B. Structural Analysis II: Microfabrics (4) III. Green
Seminar—3 hours; laboratory—3 hours. Prerequisite: consent of instructor; course 218A recommended. Microscopic structural aspects of deformed metamorphic rocks, emphasizing deformation features and the origin and significance of preferred crystallographic orientation. Offered in odd-numbered years.

220. Mechanics of Geologic Structures (3) II. Twiss
Lecture—2 hours; seminar—1 hour. Prerequisite: course 162, or consent of instructor, and 105. Application of principles of continuum mechanics to understanding development of geologic structures such as folds, fractures, faults, dikes, cleavage, boudinage. Offered in odd-numbered years.

226. Advanced Sedimentation and Sedimentary Petrology (4) II. Mount
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124 or consent of instructor. Advanced petrographic and stratigraphic study of major sedimentary rock suites. Lecture emphasis on recognition and interpretation of the spatial and temporal variations in sedimentary rock textures and mineralogies. Laboratory focus on provenance and diagenesis. Subjects vary yearly. May be repeated for credit.

228. Marine Geology (3) III. Margolis
Lecture—3 hours. Prerequisite: courses 106, 116, 150B or 165, or consent of instructor. Critical discussions and review of selected topics in marine geology such as paleoceanography, biostratigraphy of the ocean basin, evolution of ocean basins and margins, and sea-bed mineral resources. Topics vary yearly. May be repeated for credit.

230. Advanced Mineralogy (3) III. Day
Lecture—3 hours. Prerequisite: course 60 or the equivalent; undergraduate background in petrology. Crystallography and crystal chemistry of the major rock forming minerals. Principles of mineral behavior. Offered in odd-numbered years.

245. Metamorphic Petrology (5) I, Day
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 125 or consent of instructor. Metamorphic processes; origin and characteristics of metamorphic rocks; laboratory study of representative rock suites in hand specimen and thin section. Offered in even-numbered years.

246. Physical Chemistry of Metamorphic Processes (3) II. Day
Lecture—3 hours. Prerequisite: course 125, Chemistry 110A, or consent of instructor. Physiochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks. Offered in odd-numbered years.

***247. Metamorphic Petrology Seminar** (3) I, Day
Seminar—3 hours. Prerequisite: course 245; course 246 recommended. Selected topics in metamorphic petrology (e.g., mass transport processes, tectonic settings, geothermometry, thermal structure of metamorphic belts, regional studies). May be repeated for credit when topic is different. Offered in odd-numbererd years.

250. Advanced Geochemistry Seminar (3) III. Taylor
Seminar—3 hours. Prerequisite: course 115 or consent of instructor. Critical review of selected topics in geochemistry including: ore genesis, hydrothermal and geothermal fluids, recent and ancient sediments, isotope geology, origin and chemistry of the oceans. Subject varies yearly depending on student interest. May be repeated for credit. Offered in odd-numbered years.

254. Phase Equilibria (3) I, Finnerty
Seminar—3 hours. Prerequisite: Chemistry 1C and Mathematics 22A; physical chemistry recommended. Physiochemical aspects of the phase relations in silicate systems and their application to the petrogenesis of igneous and metamorphic rocks.

260. Paleontology (3) II. Lipps, Cowen
Seminar—3 hours. Prerequisite: course 111A or 111B, or graduate standing in a biological science. Selected problems in paleontology. Subject to be studied will be decided at an organizational meeting.

263. Functional Morphology of Fossil Invertebrates (4) III. Cowen
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 111A or Zoology 112. Principles and methods of functional analysis of fossils, with special reference to selected problems in invertebrate phyla.

269. Evolutionary Biology of Protista (3) I, Lipps
Seminar—3 hours. Prerequisite: course 111B. Analysis and discussion of selected topics on the evolution of single-celled organisms with emphasis on their fossil record and biology. Offered in even-numbered years.

***270. Advanced Study of Ore Deposits** (5) II. Taylor
Lecture—3 hours, laboratory—6 hours. Prerequisite: courses 120 (may be taken concurrently), 122, 123, 125, 170, or consent of instructor; course 124 recommended. Mode of occurrence, genesis, geochemistry, petrology, and aspects of exploration of selected varieties of ore deposits. Laboratory study of representative suites of ores and associated rocks by transmitted and reflected light. Offered in even-numbered years.

***271. Seminar in Ore Deposits** (3) III. Taylor
Seminar—3 hours. Prerequisite: course 170. Critical review of topics in ore deposits selected according to participants' particular interests, such as studies of particular types of ore deposits, tectonic settings, sulfide mineralogy, etc. May be repeated for credit. Offered in even-numbered years.

280. Igneous Petrology (3) III. Finnerty
Seminar—2 hours; laboratory—3 hours. Prerequisite: course 123. 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. (S/U grading only.)

291. Geology of the Sierra Nevada (1) III. Day, Moores
Seminar—one day-long session. Prerequisite: consent of instructor. Short oral presentations by students and faculty concerning results of their past work and plans for future work in the Sierra. A written abstract is required following the format required at professional meetings. (S/U grading only.)

295. Advanced Problems in Geodynamics (3) III. Twiss
Seminar—3 hours. Prerequisite: course 105 or consent of instructor. Seminar dealing with problems in geodynamics. Topics will vary (e.g., ductile deformation mechanisms, brittle fracture, earthquake prediction, driving forces for plate tectonics, mantle convection). Emphasis on recent literature. May be repeated for credit. (S/U grading only.)

296. Advanced Problems in Tectonics (3) III. Moores
Seminar—3 hours. Prerequisite: course 108 or consent of instructor. Seminar dealing with current problems in tectonics of selected regions. Topics will change from year to year. Emphasis on study of recent literature. May be repeated for credit. (P/NP grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

German

(College of Letters and Science)

Winder McConnell, Ph.D., Chairperson of the Department

Department Office (German and Russian), 416 Sproul Hall

Faculty

Wilbur A. Benware, Ph.D., Associate Professor
[2]Clifford A. Bernd, Ph.D., Professor
John F. Fetzer, Ph.D., Professor
Ingeborg Henderson, Ph.D., Lecturer
[1]Roland W. Hoermann, Ph.D., Professor
Winder McConnell, Ph.D., Associate Professor
Karl R. Menges, Ph.D., Professor
H. Guenther Nerjes, Ph.D., Professor Emeritus
Fritz Sammern-Frankenegg, Ph.D., Associate Professor
Peter M. Schaeffer, Ph.D., Professor

The Major Program

This major explores in depth the language, the literary developments, and the cultural trends in the German-speaking world. The program is designed in such a way as to accommodate students whose interest lies either in the pursuit of literary or linguistic studies. Accordingly the department offers a major program with emphasis on the literary movements from the beginnings to the present time as well as a program which focuses on the acquisition of language skills (reading, writing, speaking, understanding) within the framework of theoretical and historical courses in German linguistics. Both programs open possibilities for advanced study at the graduate level as well as career opportunities in fields such as international relations, business, the sciences and the arts.

German

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter (for both German Language and Literature)	**4-22**
German 1-2-3 (or the equivalent)	0-18
German 4 or 6A-6B	4
Recommended: Linguistics 1.	
Depth Subject Matter	**40**
German Literature Emphasis	
German 101, 121A, 121B, 121C	16
German 102, 103 (must be taken in residence)	8
Additional upper division units in literature. Include one 4-unit course in comparative literature, another national literature, or German literature in translation.	16
Germen Language Emphasis	
German 101, 102, 103	12
German 104A-104B	8
Two courses from 105, 106, 107, 108	8
German 120 and one upper division literature course	8
Additional upper division units chosen in consultation with the adviser	4
Total Units for the Major (both emphases)	**44-62**

Minor Program Requirements:

The Department offers a German Language minor and a German Literature minor. In addition, individualized minor programs may be designed upon consultation with the undergraduate adviser.

The minor program can be of particular importance to students who wish to round out their training in other fields through a foreign language or literature degree.

	UNITS
German Language	**18-24**
Choose courses numbered from German 100A through 109	18-24
German Literature	**18-24**
Choose courses numbered from German 101-109, 120, 121, and above	18-24
One lower division course from German 48 to 52 may be counted.	

Major Adviser. P. M. Schaeffer.

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 92.

Teaching Credential Subject Representative. I. Henderson. See page 98 for the Teacher Education Program.

The Master of Arts Degree. The Department offers programs of study leading to the M.A. degree under both Plan I (thesis) and Plan II (comprehensive final examination). A minimum of 36 units is required. Further information may be obtained by writing to the Department Chairperson.

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 Department Chairperson.

Graduate Adviser. C. A. Bernd.

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. Henderson
Discussion—5 hours; laboratory—two ½-hour sessions. (Students who have successfully completed German 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary German (6) I, II, III. Henderson
Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 1.

3. Intermediate German (6) I, II, III. Henderson
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. Henderson
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. Henderson
Discussion—2 hours. Prerequisite: course 3. (Courses 4 and 6B may be taken concurrently with or subsequent to 6A.) Conversational practice based on everyday vocabulary of modern spoken German. (P/NP grading only.)

6B. Spoken German (2) I, II, III. Henderson
Discussion—2 hours. Prerequisite: course 3. (Courses 4 and 6A may be taken concurrently with 6B.) Conversational practice based on everyday vocabulary of modern spoken German. Topics vary from course 6A. (P/NP grading only.)

10. Basic Reading German (4) I. The Staff
Discussion—3 hours; translation project—1 hour. Intensive course for non-majors to provide reading proficiency with texts containing basic sentence patterns and standard general vocabulary. Completion of three-course sequence, 10 and one segment each of 11 (H, N, or S) and 12 (H, N, or S), satisfies Letters and Science College foreign language requirement. Students who have successfully completed the second or more advanced year of high school level course work in the 10th or higher grade may receive unit credit for this course on a P/NP grading basis only.

11H, 11N, 11S. Reading German (4) II. The Staff
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. The Staff
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.)

***48. Myth and Saga in the Germanic Cultures** (3) III. Hoermann
Lecture—3 hours. Knowledge of German not required. Reading in English translation from the Norse Eddas, the Volsung and Sigurd-Siegfried cycles, and the Gudrun lays; literary mythology in German Romanticism culminating in Wagner's "total art-work" concept and "The Ring of the Nibelungs" cycle. May be counted toward major in German. Offered in odd-numbered years.

50. Survey of German Culture in English Translation (2) I, Fetzer
Lecture—2 hours. Knowledge of German not required. Characteristic themes in the mainstream of German culture, from medieval intellectual and artistic achievements to the modern period. Study of major trends in arts and literature.

***51. Masterworks of German Literature in English Translation, I** (2) II. Hoermann
Discussion—2 hours. Knowledge of German not required. Representative masterworks in English translation, beginning with such heroic epics as the *Nibelungenlied* and courtly romances such as *Parzival* and *Tristan und Isolde*, through the baroque period. Enlightenment, Storm and Stress, Weimar Classicism, and ending with literary fairytales of Romanticism (1830).

***52. Masterworks of German Literature in English Translation, II** (2) III. Hoermann
Discussion—2 hours. Knowledge of German not required. Representative masterworks in English translation, beginning with the psychological realism of Büchner's *Woyzeck*, progressing through Naturalism and Expressionism, culminating in works by Mann, Kafka, Rilke and Brecht, and terminating with existential and absurdist perspectives (1830 to present).

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100A. Advanced German Conversation (2) I. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency.

100B. Advanced German Conversation (2) II. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency.

100C. Advanced German Conversation (2) III. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 4. Intensive conversational practice, accurate pronunciation, and language fluency.

101. Composition and Conversation (4) I, II, III. The Staff
Discussion—3 hours; written reports. Prerequisite: course 4 or consent of instructor. Practice in short essay writing. Discussion based on readings from a variety of German texts.

102. Composition and Conversation (4) I, II, III. The Staff
Discussion—3 hours; written reports. Prerequisite: course 101 or consent of instructor. Practice in short essay writing with an aim toward refinement and expansion of vocabulary. Discussion based on readings in a variety of German texts.

103. Advanced Composition and Conversation (4) I, II, III. The Staff
Discussion—3 hours; written reports. Prerequisite: course 102 or consent of instructor. Advanced essay writing and discussion of selected texts.

104A. Translation (4) I. The Staff (Chairperson in charge)
Discussion—3 hours; written reports. Prerequisite: course 103 or the equivalent. Exercises in German/English translation using literary and non-literary texts of different styles and linguistic difficulties.

NOTE: For key to footnote symbols, see page 123.

104B. Advanced Translation (4) II. The Staff (Chairperson in charge)
Discussion—3 hours; written reports. Prerequisite: course 104A or the equivalent. Exercises in German/English translation of literary and non-literary texts.

105. German Phonology-Morphology (4) I, Benware
Discussion—3 hours; written or oral report. Prerequisite: course 4; Linguistics 1 recommended. Modern German phonetics and the structure of the phonological system. Elementary morphological analysis. Offered in odd-numbered years. (Same course as Linguistics 105.)

***106. History of the German Language** (4) II. Benware
Discussion—3 hours; written reports. Course 105 or Linguistics 1 recommended. Survey of the development of the German language and study of its structure in historical perspective. Offered in even-numbered years. (Same course as Linguistics 106.)

107. Modern German Syntax (4) II. Benware
Discussion—3 hours; term paper. Prerequisite: course 102 or the equivalent or consent of instructor; Linguistics 1 recommended. Examination of the major problems in describing modern German sentence structure. Offered in odd-numbered years.

***108. Varieties of Modern German** (4) II. Benware
Discussion—3 hours; term paper. Prerequisite: course 103. Relationship of standard High German to the modern dialects. Uses of modern German in various fields such as advertising, politics, and ideology. Offered in even-numbered years.

109. Business German (4) III. Henderson
Lecture-Discussion—4 hours. Prerequisite: course 101 or consent of instructor. Specialized advanced language course using business-oriented information and publications as the basis for discussions, role-play, reports, compositions and translations.

***110. Older German Literature in English Translation** (4) I, McConnell
Discussion—3 hours; written reports. Prerequisite: upper division standing or consent of instructor. Knowledge of German not required. Course intended for non-majors. Analyses in English of works of German literature from the Middle Ages through the Reformation *(Nibelungenlied,* Gottfried's *Tristan und Isolde* or Wolfram's *Parzival,* lyric poetry, selections from works of Johann von Tepl, Conrad Celtes, Sebastian Brant, Erasmus, Luther). Offered in odd-numbered years.

***111. Studies of Major Writers from the Seventeenth to the Twentieth Century (in English)** (4) II. The Staff
Discussion—3 hours; written reports. Prerequisite: upper division standing or consent of instructor. Knowledge of German not required. Course intended for non-majors. Study of principal works in English translation by one or more major authors such as Grimmelshausen, Lessing, Schiller, Goethe, Heine, Büchner, Hauptmann, Thomas Mann, Brecht, and Kafka. Content will alternate each time course is offered.Offered in even-numbered years.

***112. Special Topics in German Literature** (4) II. The Staff
Discussion—3 hours; written reports. Knowledge of German not required. Analysis of significant themes in German literature: myths, legends and fairytales; war and social unrest as literary topics; satire and humor in contemporary German literature. Offered in odd-numbered years.

113. Goethe's *Faust* (4) II. Bernd
Lecture—3 hours; oral reports. Knowledge of German not required. Course intended for non-majors. The Faust tradition: from the legendary contemporary of Luther, the popular chapbook versions, Marlowe's drama to Goethe's world classic. Part I and II. Offered in odd-numbered years.

***114. Hermann Hesse** (4) III. The Staff
Lecture—3 hours; additional readings and written reports Knowledge of German not required. Course intended for non-majors. A study of the main ideas and issues of the principal novels, with emphasis on man's dualism and his search for self-knowledge and self-fulfillment. Discussion of such works as *Siddhartha, Steppenwolf, Narcissus and Goldmund.* Offered in even-numbered years.

115A. German Literature since 1945 (4) I, Menges
Lecture—3 hours; written reports—1 hour. Reading of major writers including the post-war generation of Austria, Switzerland and West-Germany. Discussion of novelists like Böll, Grass, Johnson, Walser, Handke; playwrights such as Frisch, Dürrenmatt and Hochhuth and poets like Celan, Enzensberger and Aichinger. Knowledge of German not required.

***115B. German Literature since 1945** (4) II. Schaeffer
Lecture—3 hours; written reports—1 hour. Reading and discussion of the literature of the German Democratic Republic (East Germany), the theory of literature in the socialist world, the practice of this literature as exemplified in such authors as Strittmatter, Seghers, Wolf, Kant, Hacks. Knowledge of German not required.

120. Survey of German Culture (4) III, Fetzer
Discussion—3 hours; written reports. Prerequisite: course 4 or the equivalent. Major developments in such areas of German life as the arts, philosophical thought, social institutions, and political history.

121A. Survey of German Literature from Around 800 to Period of Baroque (4) I, McConnell
Lecture-discussion—3 hours; written report—1 hour. Prerequisite: course 101 (may be taken concurrently). Survey of German literature from the Carolingian beginnings around 800 to the period of Baroque. Emphasis on major works representative of the various literary epochs.

121B. Survey of German Literature from 1700 to 1848 (4) II. Schaeffer
Lecture-discussion—3 hours; written reports—1 hour. Prerequisite: course 101 (may be taken concurrently). Survey of German literature from the Enlightenment to *Biedermeier* with particular emphasis on classical and romantic movements in eighteenth and early nineteenth centuries.

121C. Survey of German Literature from 1850 to Present (4) III. Menges
Lecture-discussion—3 hours; written reports—1 hour. Prerequisite: course 101 (may be taken concurrently). Survey of German literature from the beginnings of Realism (1850) to present. Particular emphasis on emergence of modern and contemporary (postwar) literary developments.

***122. The Medieval Period in German Literature** (4) I, McConnell
Discussion—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. The literary-philosophical profile of the *Mittelhochdeutsche Blütezeit* in terms of the significant courtly and folk epics and the *Minnesang.* Readings in modern German. Discussion in German and English. Offered in odd-numbered years.

***123. Literature of the Classical Age** (4) II. The Staff
Discussion—3 hours; written or oral reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. A critical assessment of principal works of Goethe and Schiller in their development from *Sturm und Drang* individualism and rebellion to the balanced harmony of the classical period. Offered in even-numbered years.

***126. Modern German Literature** (4) III. Menges
Discussion—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Selections from the significant works of major twentieth-century writers, such as Hesse, Mann, Kafka, Rilke, Brecht, Grass. Discussion in German and English. Offered in even-numbered years.

132. The German *Novelle* (4) III. Bernd
Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Inquiry into the art of the "Novelle" through analysis of the materials and formal devices of representative authors from Goethe to Kafka. Discussion in German and English.

133. The German Drama (4) II. Fetzer
Lecture—3 hours; written reports. Prerequisite: course 101 (may be taken concurrently) or consent of instructor. Readings in the works of Germany's leading dramatists from the seventeenth century to the present day, such as Lessing, Goethe, Schiller, Kleist, Hebbel, Hauptmann, Brecht. Discussion in German and English.

194H. Special Study for Honors Students (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

Note: Aside from courses 210 and 202 (which are usually offered on a yearly basis), regular graduate course offerings fall into two categories, general and special.

General—201-210, 242, 285-296. These are subdivided into the following areas: (1) Germanic linguistics, (2) literature to 1400, (3) literature, 1400-1700, (4) literature, 1700-1785, (5) literature, 1785-1830, (6) literature, 1830-1910, (7) literature, 1910-1933, (8) literature, 1933-1965, (9) literature, 1965-present.

Special—240, 241, 251-261, 297. These courses deal with a single topic, which frequently transcends the limits of the above General areas.

During any three-year cycle, the Department offers each one quarter at least one course from one of the nine general areas and one special course (according to expressed student need).

201. Old High German (4) II. Benware
Seminar—3 hours. Study of the beginnings of German as a written language through the reading of selected texts from the eighth through the eleventh centuries. A linguistic analysis of the dialects. Offered in odd-numbered years.

202. Middle High German (4) II. Benware
Seminar—3 hours. Outline of grammar; selections from Middle High German epic and lyric poetry.

205. History of the German Language (4) I, Benware
Seminar—3 hours. Development of the German language with emphasis on the early periods, from Indo-European to Middle High German. (Same course as Linguistics 205.)

206. Syntax of Modern German (4) I, Benware
Seminar—3 hours; written reports. An examination of the syntactic structures of the contemporary language using one of the current models of syntactic analysis. Offered in even-numbered years.

210. Techniques of Literary Scholarship (4) I, Fetzer
Seminar—3 hours. The bibliographical, organizational, and methodological tools and resources for advanced, independent research.

240. Forms of German Verse (4) II. Sammern-Frankenegg
Seminar—3 hours. The development of German verse from the Middle Ages to Gottfried Benn, with special emphasis on different techniques of text analysis and interpretation. May be repeated for credit with consent of instructor.

241. The German Drama (4) III. Menges
Seminar—3 hours. The major forms of German drama from its origins to the middle of the twentieth century. May be repeated for credit with consent of instructor.

242. The German *Novelle* (4) II. Bernd
Seminar—3 hours. The major German *Novellisten,* with particular emphasis on the flowering of this genre in the nineteenth century. May be repeated for credit with consent of instructor.

251. Seminar in a Major Author (4) III. The Staff
Seminar—3 hours; written report. The course will concern the work of a major German author. May be repeated for credit with consent of instructor; actual content will vary from year to year.

252. The Writing of Lessing (4) I, Sammern-Frankenegg
Seminar—3 hours. Study of Lessing's theory of literature with particular emphasis upon his critical attacks on French drama.

253. Goethe (4) II. Bernd
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. Bernd.
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. Sammern-Frankenegg
Seminar—3 hours. A reading of all works with emphasis on the ideas which impelled the development of new literary forms and concepts.

270A. Research in a Period or Topic (4) I, II, III. The Staff (Chairperson in charge)
Individual instruction from a faculty member—1 hour. Prerequisite: course 210. Individually guided research, under the supervision of a faculty member, in the specialized study of a period or problem that holds promise of yielding dissertation topics, culminating in a term paper. Recommended for Ph.D. candidates prior to the Preliminary Examination.

270B. Basic Research for the Dissertation (4) I, II, III. The Staff (Chairperson in charge)

NOTE: For key to footnote symbols, see page 123.

Individual instruction from a faculty member—1 hour. Individually guided intensive research, under the supervision of a faculty member, designed to develop expertise and generate basic materials (such as a detailed outline and bibliography) for the dissertation topic. Required for Ph.D. candidates prior to the Qualifying Examination.

280. Survey of Eighteenth-Century German Literature (4) I, The Staff
Seminar—3 hours; written report. A survey of the main trends and principal works or topical elements of eighteenth century German Literature, from the transitional writers to Gottsched and the Swiss theorists; Sentimentality and Anacreontic; from Klopstock to Lessing and the beginning of the Classical Age.

281. Survey of Nineteenth-Century German Literature (4) II. Sammern-Frankenegg
Seminar—3 hours; written reports—1 hour. A survey of the main trends and topical elements in nineteenth-century German Literature from 1815 until the rise of naturalism with special emphasis on a developing concept of realism and its reflection in representative works by authors from Germany, Austria and Switzerland.

282. Survey of Twentieth-Century German Literature (4) III. Menges
Seminar—3 hours; written reports—1 hour. A survey of the main trends and principal works or topical elements of twentieth-century German Literature from Naturalism (Hauptmann), through Symbolism (Rilke, Hofmannsthal), *Neue Sachlichkeit* to literary developments after 1945 in East Germany, Switzerland, Austria and West Germany.

285. Middle High German Literature (4) III. McConnell
Seminar—3 hours; report and term paper. Prerequisite: course 202 or consent of instructor. Extensive reading of Middle High German texts in the original language. Examines linguistic and literary problems. May be repeated for credit with change of subject matter and consent of instructor.

288. The Renaissance and Reformation in German Literature (4) I, Schaeffer
Seminar—3 hours. 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 "Elegantiaideal" 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. The Staff
Seminar—3 hours. The revolt against the excesses of the "Elegantiaideal," and the evolution of a new literature based on reason and wit. May be repeated for credit with consent of instructor.

292. Sentimentality and "Sturm und Drang" in German Literature (4) III. The Staff
Seminar—3 hours; written reports. Reaction to overemphasis on Reason: theories of Hamann and Herder and works of poets such as Lenz, Leisewitz, the early Goethe and Schiller. May be repeated for credit with consent of instructor.

293. The Classical Age of German Literature (4) II. Bernd
Seminar—3 hours. Inquiry into the aesthetic and humanistic qualities of Germany's greatest literary epoch. May be repeated for credit with consent of instructor.

294. The Romantic Period in German Literature (4) III. Fetzer
Seminar—3 hours. Survey of the works of early nineteenth-century authors in reaction against the age of classicism. May be repeated for credit with consent of instructor.

295. Poetic Realism in German Literature (4) I, Bernd
Seminar—3 hours. Outstanding figures in German literature between 1840 and 1890. Important phases in their developments will be treated. May be repeated for credit with consent of instructor.

296. Twentieth-Century German Literature (4) II. Menges
Seminar—3 hours. Considers the revolt of the Hauptmann generation, symbolism, expressionism, and the chief currents of the contemporary scene. May be repeated for credit with consent of instructor.

297. Special Topics in German Literature (4) II. The Staff
Seminar—3 hours, written report. The course will be concerned with various special topics in German Literature, which may cut across the more usual period and genre rubrics. May be repeated for credit; actual content will vary from year to year.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Special Study for the Doctoral Dissertation (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

390A. The Teaching of German (1) I, Henderson
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. Henderson
Lecture—1 hour. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Intended primarily for graduate teaching assistants. (S/U grading only.)

390C. The Teaching of German (1) III. Henderson
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.)

400. Tutorial and Instructional Internship (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: graduate standing. Apprentice training in ongoing undergraduate literature courses taught by regular staff, with supplementary weekly critique sessions; intern leadership of discussion sections under staff supervision. May be repeated for credit.

Greek

See Classics

Hebrew

See Religious Studies

History

(College of Letters and Science)

Rollie E. Poppino, Ph.D., Chairperson of the Department

Department Office, 176 Voorhies Hall (752-0776)

Faculty

Luis L. Arroyo, Ph.D., Assistant Professor
Arnold J. Bauer, Ph.D., Professor
William M. Bowsky, Ph.D., Professor
[1]Cynthia L. Brantley, Ph.D., Associate Professor
[2]David Brody, Ph.D., Professor
Daniel R. Brower, Jr., Ph.D., Professor
[3]Daniel H. Calhoun, Ph.D., Professor
Robert O. Crummey, Ph.D., Professor
[4]Manfred P. Fleischer, Ph.D., Professor
Paul Goodman, Ph.D., Professor
William W. Hagen, Ph.D., Professor
[4]W. Turrentine Jackson, Ph.D., Professor
David L. Jacobson, Ph.D., Professor
Earl H. Kinmonth, Ph.D., Associate Professor
Norma B. Landau, Ph.D., Associate Professor
Kwang-Ching Liu, Ph.D., Professor
[3]Eugene Lunn, Ph.D., Professor
[2 3]C. Roland Marchand, Ph.D., Professor
Ted W. Margadant, Ph.D., Professor
Rollie E. Poppino, Ph.D., Professor
[3 4]Don C. Price, Ph.D., Professor
Ruth E. Rosen, Ph.D., Associate Professor
Richard N. Schwab, Ph.D., Professor
Morgan B. Sherwood, Ph.D., Professor
James H. Shideler, Ph.D., Professor
[4]Wilson Smith, Ph.D., Professor
Stylianos Spyridakis, Ph.D., Professor
[2 3]Joe W. Trotter, Jr., Ph. D., Assistant Professor
F. Roy Willis, 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.

History is also a practical major if one is considering a professional career such as teaching, law, journalism, public administration, or business management. Professional schools in these and related fields are looking for students who can weigh conflicting evidence, evaluate alternative courses of action or divergent points of view, and express conclusions logically in everyday language. These analytical skills are stressed in many history classes, and their mastery gives the history student a solid preparation for subsequent training in a specialized career.

A student electing a major in History may complete Plan I, Plan II, or Plan III. *Plan I* enables students to concentrate chiefly on the history of one geographic area or time period of their choosing. The purpose of *Plan II* is to encourage interested students, including those preparing for graduate work in history, to enroll in a seminar, to undertake independent work, and to study the history of history as part of the major. Students preferring more active engagement in research and writing are encouraged to follow Plan II. The purpose of *Plan III* is to enable students to study in depth the field of twentieth-century history, whose common problems of political conflict, social development, and cultural creativity cut across the several geographical fields of concentration which the department now offers.

History

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter (Plans I, II, and III)	**20**
Five lower division courses, including at least two from each of two of the following fields	20
a. Western Civilization: History 4A, 4B, 4C, 1, 2, 3, 10, 30	
b. Asian Civilization: History 9A, 9B	
c. United States and Latin America: History 7, 17A, 17B, 22, 27A, 27B, 72A, 72B.	
Depth Subject Matter—Plan I	**40-41**
At least six upper division courses from one of the fields of concentration* listed below. Include a two-quarter sequence of courses	24
At least three upper division courses from one of the other fields listed	12
At least one course from the following: History 101 or 102 (in field of concentration), or 103 (in field of concentration)	4-5
Total Units for the Major, Plan I	**60-61**
Depth Subject Matter—Plan II	**42**
At least four upper division courses from one of the fields of concentration listed below. Include a two-quarter sequence of courses	16
At least three upper division courses from one of the other fields listed	12
History 101	5
History 102 in field of concentration	5
History 103 in field of concentration	4
Total Units for the Major, Plan II	**62**
Depth Subject Matter—Plan III	**41**
History 146A, 146B, 174B, 174C	16
At least three upper division courses chosen from the following list of twentieth-century courses, classified by area of concentration. At least one course must be from category A.	12

NOTE: For key to footnote symbols, see page 123.

A. Asia and Latin America: 161B, 163B, 165, 166B, 168, 190C, 193, 194C, 195
B. United States: 169B, 172, 174A, 174D, 175C, 176B, 176C, 177, 179, 180C, 185B, 188B, 189C
c. Europe: 137C, 141, 143, 144, 147B, 147C, 151D

History 102, on a topic in twentieth-century history (normally chosen from sections E, F, H, I, J, M, N, or O) 5

Two additional upper division history courses selected from courses within a single field of study (e.g., Europe, United States, Africa, Latin America, Asia) which do not cover twentieth-century history 8

Total Units for the Major, Plan III **61**

Fields of Concentration*

a. European: History 102A, 102B, 102C, 102D, 102E, 102F, 102I, 102P, 111A, 111B, 111C, 121A, 121B, 121C, 130A, 130B, 130C, 131A, 131B, 131C, 133, 134A, 134B, 137A, 137B, 137C, 138, 141, 143, 144, 145, 146A, 146B, 147A, 147B, 147C, 148, 151A, 151B, 151C, 151D, 154.
b. United States: History 102K, 102L, 102M, 169A, 169B, 170A, 170B, 170C, 171A, 171B, 173, 174A, 174B, 174C, 174D, 175A, 175B, 175C, 176A, 176B, 176C, 177, 178, 179, 180A, 180B, 180C, 183A, 183B, 185A, 185B, 188A, 188B, 189A, 189B, 189C.
c. East Asia: History 102G, 102H, 102N, 190A, 190B, 190C, 191A, 191B, 193, 194A, 194B, 194C, 194D, 195.
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: Asian American studies, classics, cultural anthropology, cultural geography, principles of economics, English literature, literature of the United States, philosophy, political science, psychology, sociology, or statistics.

Major Advisers. L.L. Arroyo, W.M. Bowsky, C.L. Brantley, D.H. Calhoun, R.O. Crummey, M.P. Fleischer, P. Goodman, D.L. Jacobson, E.H. Kinmonth, N.B. Landau, C.R. Marchand, T.W. Margadant, D.C. Price, R.E. Rosen, R.N. Schwab, M.B. Sherwood, S. Spyridakis, J.W. Trotter.

Minor Program Requirements:

History units may be taken in a single field of concentration, such as Africa, East Asia, Europe, Latin America or the United States. Alternatively, students may select a minor with a thematic emphasis, as listed below, or design a thematic minor in consultation with a Department adviser. One course for the minor in history may be taken on a passed/not passed basis.

	UNITS
History	**20**
At least 20 units of upper division history courses	20

Examples of minor with thematic emphasis:

a. Pre-Law (British and American Political and Constitutional Development)—twenty units chosen from History 151A, 151B, 151C, 170B, 180A, 180B, 180C, 102I or 102L (with approval of adviser).
b. The Twentieth Century—twenty units selected from History 146A, 146B, 174B, 174C (at least 8 of the units); 102E, 102F, 102H, 102I, 102J, 102M, 102N, or 102O, 116, 137C, 141, 143, 144, 147B, 147C, 151D, 161B, 163B, 165, 166B, 168, 169B, 172, 174A, 174D, 175C, 176B, 176C, 177, 179, 180C, 185B, 188B, 189C, 190C, 193, 194C, 195.
c. The History of Ideas in Society—twenty units selected from History 101, 102A-P (with approval of adviser), 130A, 130B, 130C, 133, 134A, 134B, 147A, 147B, 147C, 175A, 175B, 175C, 177, 179, 185A, 185B, 191A, 191B, 194B.

Minor Advisers. Same as for major advisers.

Honors and Honors Program. A student may become eligible for graduation with highest honors by meeting the minimum grade-point average required by the College of Letters and Science and by demonstrating unusually imaginative or creative work in history. Such creative work may be demonstrated in various ways: in undergraduate seminars, in independent study, in special projects, or by distinguished work in Plan II of the major program. Departmental recommendation, based on clear evidence of distinction and originality, is a prerequisite for the awarding of highest honors.

Teaching Credential Subject Representative. D. L. Jacobson. See page 98 for the Teacher Education Program.

Waiver Program for Single-Subject Teaching Credential in History. The Department of History offers a program of study for students seeking a secondary teaching credential in history. The program consists of 45 course units, including courses 17A and 17B, two lower division courses in Western Civilization (1, 3, 4A, 4B, 4C) of which one must be 3 or 4C, one undergraduate seminar (course 101 or 102), and six additional courses, of which four must be at the upper division level. Successful completion of this program will allow the student to receive a waiver from examinations for the History Single-Subject Teaching Credential.

Education at Home Program (EHP). In the Winter Quarter of 1985, the UCR campus will continue the Education at Home Program for those students with special interest in early American history and culture. Those selected for participation in this program will spend nine weeks in Williamsburg, one in Philadelphia, and a concluding week in Washington, D.C. *This program is open to all undergraduates from any campus in the UC system.*

Registration (through the Riverside campus) will be made for the following three courses in the Department of History: 157, 158, and 159. Special arrangements for additional independent study (maximum of 4 units) may be made with the student's home campus. For further information, brochures or application forms, telephone Riverside campus, (714) 787-3820.

Graduate Study. The Department of History offers programs of study and research leading to the M.A., M.A.T., and Ph.D. degrees in history. Detailed information may be obtained by writing to the Graduate Adviser, Department of History.

Graduate Advisers. A.J. Bauer, D. Brody, W.W. Hagen, K.C. Liu, E. Lunn, W. Smith, F.R. Willis.

American History and Institutions. This University requirement can be satisfied by passing any one of the following courses in History: 17A, 17B, 27A, 27B, 72A, 72B, 170A, 170B, 170C, 171A, 171B, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 177, 179, 180A, 180B, 183A, 183B. The upper division courses may be used only with the consent of the instructor. (See also page 61.)

Courses in History

Lower Division Courses

1. The Bible and Ancient History (4) I, Schwab
Lecture—3 hours; discussion—1 hour. Examination of the Judaeo-Christian tradition as it met ancient Near Eastern and classical ideas and institutions through New Testament times. Emphasis on the Bible as a historical document and on historical-critical interpretation of scriptures.

2. Ancient Civilizations (4) III. Fleischer
Lecture—3 hours; discussion—1 hour. Growth of ancient civilizations from the Sumerians to the Fall of the Roman Empire.

***3. Cities: A Survey of Western Civilization** (4) II. Willis
Lecture—3 hours; discussion—1 hour. Survey of western civilization, focusing on nine cities, at the period of their greatest creativity: Athens, Rome, Constantinople, Paris, Florence, Amsterdam, London, Berlin, Moscow. Illustrated with slides, music, and optional films.

4A. History of Western Civilization (4) I, II. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Growth of western civilization from late antiquity to the Renaissance.

4B. History of Western Civilization (4) II, III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Development of western civilization from the Renaissance to the Eighteenth Century.

4C. History of Western Civilization (4) I, III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Development of Western Civilization from the Eighteenth Century to the present.

***7. Latin American Civilization** (4) III. Bauer
Lecture—3 hours; discussion—1 hour. Introduction to Latin America from the Mayas, Incas and Aztecs to the present. Presents a micro-cosmic picture of a single individual (ranging from an Aztec peasant to Eva Perón) each week drawn from documentary and photographic evidence. Supplementary sessions explain the individual's social context and significance.

9A. History of East Asian Civilization (4) I, III. Liu, Price
Lecture—3 hours; discussion—1 hour. Surveys traditional Chinese civilization and its modern transformation. Emphasis is on thought and religion, political and social life, art and literature. Perspectives on contemporary China are provided.

9B. History of East Asian Civilization (4) II.Kinmonth
Lecture—3 hours; discussion—1 hour. Surveys traditional Japanese civilization and its modern transformation. Emphasis is on thought and religion, political and social life, art and literature. Perspectives on contemporary Japan are provided.

10. World History of the Twentieth Century (4) II. Brower
Lecture—3 hours; discussion—1 hour. History of the world in the twentieth century, emphasizing major powers and their leaders (Wilson, Lenin, Hitler, Roosevelt, Stalin, Mao, Nehru, Nasser, Castro).

***15. Introduction to African History** (4) I, Brantley
Lecture—3 hours; term paper. Examination of the long-range historical context as background to current conditions in Africa. This survey includes the early development of African civilizations through the twentieth-century colonization by Europeans.

17A. History of the United States (4) I, III. The Staff
Lecture—3 hours; discussion—1 hour. 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. American people from Reconstruction to the present.

***18. Introduction to United States History Through Film** (4) I, Goodman
Lecture-discussion—4 hours; use of films. Introduction to American history using approximately nine films with parallel readings on selected themes, such as the American Indian, the Civil War, the Great Depression, the cult of success. Topics and films may vary.

22. Violence and Law in America (4) III. Calhoun
Lecture—2 hours; discussion—2 hours. Movements of protest or social control from the revolutionary period to the present.

27A. Afro-American History (4) I, Trotter
Lecture—3 hours; discussion—1 hour. History of black people in the United States from the African background to Reconstruction.

27B. Afro-American History (4) II. Trotter
Lecture—3 hours; discussion—1 hour. History of black people in the United States from Reconstruction to the present.

30. Russian Cultural History (4) I, Crummey
Lecture—3 hours; discussion—1 hour. Survey of Russia's history over the last thousand years as reflected in the lives of her political leaders, artists, and rebels. Lectures will use the biographies of Russian political leaders, intellectuals and artists to illustrate the general currents of the country's political, social and cultural development.

NOTE: For key to footnote symbols, see page 123.

72A. Social History of American Women and the Family (4) I, Rosen
Lecture—3 hours; discussion—1 hour. Social and cultural history of women, sex roles and the family from colonial America until the late nineteenth century emphasizing changes resulting from the secularization, commercialization and industrialization of American society.

72B. Social History of American Women and the Family (4) II. Rosen
Lecture—3 hours; discussion—1 hour. Social and cultural history of women, sex roles and the family in twentieth-century America, emphasizing female reformers and revolutionaries, working class women, consumerism, the role of media, the "feminine mystique," changes in family life, and the emergent women's movement.

***85. Nature, Man and the Machine in America** (4) II. 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.

86. Quackery and Pseudoscience in America (4) I, Sherwood
Lecture—3 hours; tutorial supervision of research paper. History of humbug and pseudoscience in America: witchcraft, medical quackery, spiritualism, science hoaxes, technological frauds, literary and artistic forgeries, UFOs, pyramidology, astrology, psychic phenomena. Emphasis upon explanations for the existence of deception and pseudoscience.

***90A. Modernization of China** (4) II. Liu
Lecture-discussion—4 hours; written reports. Reading and discussion of aspects of modern China. Background on the contemporary scene is stressed.

***90B. Modernization of Japan** (4) III. Kinmonth
Lecture-discussion—4 hours; written reports. Reading and discussion of aspects of modern Japan. Background on the contemporary scene is stressed.

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) II, III. Brody, Landau, Hagen
Lecture-discussion—4 hours; term paper. Prerequisite: consent of instructor. Study of the history of historical thought and writing, analysis of critical and speculative philosophies of history and evaluation of modes of organization, interpretation and style in historical writing.

102A-P. Undergraduate Proseminar in History (5) I, II, III. The Staff
Seminar—3 hours; term paper. Designed primarily for history majors. Intensive reading, discussion, research and writing in selected topics in the various fields of history: **(A)** Ancient; **(B)** Medieval; **(C)** Renaissance and Reformation; **(D)** Modern Europe to 1815; **(E)** Europe since 1815; **(F)** Russia; **(G)** China to 1800; **(H)** China since 1800; **(I)** Britain; **(J)** Latin America since 1810; **(K)** American History to 1787; **(L)** United States, 1787-1896; **(M)** United States since 1896; **(N)** Japan; **(O)** Africa; **(P)** Christianity and Culture in Europe, 50-1850. May be repeated for credit. Limited enrollment.

103. Topics in Historical Research (4) I, II, III. The Staff (Chairperson in charge)
Discussion—3 hours; individual consultation with instructor; paper. Prerequisite: consent of instructor. Individual research resulting in a research paper on a specific topic in one of various fields of history. May be repeated for credit.

***111A. Ancient History** (4) I, Spyridakis
Lecture—3 hours; discussion or paper (student option). History of ancient empires of Near East and of their historical legacy to Western world.

111B. Ancient History (4) I, Spyridakis
Lecture—3 hours; discussion or paper (student option). Political, cultural and intellectual study of Greek world from Minoan-Mycenaean period to end of Hellenistic Age.

***111C. Ancient History** (4) III. Spyridakis
Lecture—3 hours; discussion or paper (student option). Development of Rome from earliest times. Rise and fall of the Roman Republic; the Empire to 476 A.D.

115A. History of West Africa (4) III. Brantley
Lecture—3 hours; written reports. Prerequisite: courses 4A, 4B, 4C recommended. Introductory survey of the history of West Africa and the Congo region from the earliest times to the present.

115B. History of East and Central Africa (4) II. Brantley
Lecture—3 hours; written reports. Prerequisite: course 115A recommended. Introductory survey of the history of east and central Africa from 1000 to the present. This course is a part of an interdisciplinary East African sequence which includes Anthropology 139B (fall), History 115B (winter) and Political Science 138.

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. 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) I, Brantly
Lecture—3 hours; term paper. Prerequisite: courses 115A and 115B recommended. Themes of African history, such as African states and empires, slave trade, relationship of Egypt to rest of Africa, Bantu origins and migrations, and French policy of Assimilation and Association.

121A. Medieval History (4) II. Bowsky
Lecture-discussion and panel presentations—3 hours. European history from "the fall of the Roman Empire" to the eighth century.

***121B. Medieval History** (4) I, Bowsky
Lecture-discussion and panel presentations—3 hours. European history from Charlemagne to the twelfth century.

***121C. Medieval History** (4) 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, Zwinglian-Calvinist, Radical, Anglican and Catholic Reformations as foundation stones of a new culture in Europe, with special attention to the interconnections between the revival of antiquity and the different reform movements.

130C. Christianity and Culture in Europe: 1600-1850 (4) III. Fleischer
Lecture—3 hours; written report or research paper. A survey of the intellectual, cultural and political re-orientation of European society in the aftermath of the Wars of Religion. "Secularization" will be discussed in the context of the Enlightenment and Romanticism.

***131A. Early Modern European History** (4) I, Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B recommended. Western European history from about 1350 to about 1500.

***131B. Early Modern European History** (4) II. Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B, 131A recommended. Western European history from about 1500 to about 1650.

***131C. Early Modern European History** (4) III Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B, 131B recommended. Western European history from about 1650 to about 1789.

133. The Age of Ideas (4) II. Schwab
Lecture—3 hours. The Enlightenment and its background in the seventeenth century.

***134A. The Age of Revolution** (4) III. Schwab
Lecture—3 hours. Ideas and institutions during the French Revolution and the Napoleonic era.

***134B. The Age of Revolution** (4) III. Schwab
Lecture—3 hours. Ideas and revolution after 1815. Offered in odd-numbered years.

137A. Russian History: Kievan, Muscovite, and Petrine (4) II. Crummey
Lecture—3 hours; term paper. Russian civilization from early times to 1725. Emphasis on the rise of autocracy and the evolution of society and culture.

***137B. Russian History: The Empire, 1725-1900** (4) II. Crummey
Lecture—3 hours; term paper. Russian civilization from the Petrine reforms to the end of the nineteenth century. Emphasis on the strengthening and reform of the autocracy, the rise of movements for revolutionary change, and the evolution of society and culture.

137C. Revolutionary and Soviet Russia, 1900 to the Present (4) III. Brower
Lecture—3 hours; written reports. Evolution of the Russian state and society from the collapse of tsarist Russia through the creation and consolidation of the new Soviet order.

138. History of the Russian Revolution (4) I, Brower
Lecture—3 hours; term paper and oral reports. History of the fall of the Russian autocracy and of the Revolution of 1917. Offered in even-numbered years.

141. France Since 1815 (4) II. Margadant
Lecture—3 hours; term paper.

143. History of Eastern Europe and the Balkans (4) III. Hagen
Lecture—3 hours; essays. History of the Baltic, Danubian, and Balkan lands since the Middle Ages. National cultures and conflicts in the Polish Commonwealth and the Hapsburg and Ottoman Empires; nationalist movements, 1789-1914; the twentieth century, including an analysis of the contemporary scene.

144. History of Germany since the Reformation (4) I, Hagen
Lecture—3 hours; essays. German society, culture, and politics in the ages of the Reformation and Counter-reformation, absolutism and the Enlightenment, industrialization and national unification, the World Wars, and since 1945.

145. War and Revolution in Europe, 1789-1918 (4) II. Margadant
Lecture—3 hours; term paper. Survey of revolutionary movements, international crises, and wars in Europe from the French Revolution to World War I.

***146A. Europe in the Twentieth Century** (4) I, Willis
Lecture—3 hours; term paper. Survey of the history of Europe from 1919 to 1939.

146B. Europe in the Twentieth Century (4) I, Willis
Lecture—3 hours; term paper. Survey of the history of Europe since 1939.

147A. European Intellectual History, 1800-1870 (4) I.
Lecture—3 hours; term paper. European thought in the early industrial era. Shifting cultural frameworks, from romanticism to scientism; liberal and socialist reactions to social change. Focus on the work of Goethe, Hegel, J.S. Mill, Marx, Darwin and Flaubert.

147B. European Intellectual History, 1870-1920 (4) II. Lunn
Lecture—3 hours; term paper. Cultural and intellectual watershed of the late nineteenth and early twentieth centuries. Emergence of modern art and literature; psychoanalysis and the new social sciences. Focus on the work of Baudelaire, Wagner, Nietzsche, Freud, Weber and Kafka.

147C. European Intellectual History, 1920-1970 (4) III. Lunn
Lecture—3 hours; term paper. European thought and culture since World War I. Coverage includes: literature and politics; Communism and Western Marxism; Fascism; Existentialism; Structuralism; Feminism. Particular attention to Lenin, Brecht, Hitler, Sartre, Camus, Beckett, Marcuse, Foucault, Woolf and de Beauvoir.

***148. From Cradle to Coffin: The Life Cycle in Nineteenth-Century Europe** (4) II. Margadant
Lecture—3 hours; term paper. Family lives and work experiences of Europeans in the age of the Industrial Revolution (1750-1900). Compares the childhood, adolescence, courtship and marriage, work patterns, leisure activities, and old age of workers, peasants and the middle classes.

149. Workers and Politics in Industrial Societies: A Comparative Historical Approach (4) III. Goodman
Lecture—4 hours. Comparative analysis of the development of labor parties and socialist movements in Britain, France, Germany and their failure in the United States in the nineteenth and early twentieth centuries. Political cultures, social structures, and historical experiences shaping working-class politics.

***151A. England: The Middle Ages** (4) I.
Lecture—3 hours; term paper. Prerequisite: course 4A recommended. Origins of England to the accession of the Lancastrians. Survey includes: impact of Norman Conquest on Anglo-Saxon institutions; rise of the Church, common law, parliament, and the economy; thought, arts, and literature to the age of Chaucer and Wyclif.

***151B. England: The Early Modern Centuries** (4) II.
Lecture—3 hours; term paper. Prerequisite: courses 4A, 4B; 151A recommended. From Lancaster and York to the Glorious Revolution. Includes growth of the Church of England; beginnings of modern worldwide economy; rise of the gentry and parliament; thought, arts, and literature in the times of More, Shakespeare, Hobbes, Wren, and Newton.

151C. Eighteenth-Century England (4) I, Landau
Lecture—3 hours; term paper. English history from the Glorious Revolution to the French Revolution. Examination of the transformation of one of Europe's most politically unstable kingdoms into the firmly established constitutional monarchy which provided an environment fit to engender the industrial revolution.

151D. Industrial England (4) III. Landau
Lecture—3 hours; term paper. English history from Waterloo to the Battle of Britain: the rise and continuance of the first industrial nation, examining the transformation of landed to class society, oligarchy to democracy and bureaucracy, Bentham to Bloomsbury, empire to commonwealth.

***154. Tudor and Stuart England** (5) III.
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.

NOTE: For key to footnote symbols, see page 123.

161A. Latin American History (4) I, Bauer
Lecture-discussion—3 hours; written reports. Pre-Colombian 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) III. 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) III. 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) I, Poppino
Lecture—3 hours; written reports. Major social upheavals since 1900 in Mexico, Argentina, Brazil, Bolivia, and Cuba, examined as to similarities and differences in causes, course, and consequences.

***166A. History of Mexico to 1848** (4) I, Arroyo
Lecture-discussion—3 hours; written and/or oral reports. Political, economic, and social development of pre-Colombian, colonial and national Mexico to 1848. Offered in odd-numbered years.

166B. History of Mexico Since 1848 (4) I, Arroyo
Lecture-discussion—3 hours; written and/or oral reports. History of Mexico from 1848 to the present. Offered in even-numbered years.

168. History of Inter-American Relations (4) II. Poppino
Lecture—3 hours; written reports. Diplomatic history of Latin America since independence, intra-Latin American relations, relations with the United States, participation in international organizations, and communism in Latin America.

169A. Mexican-American History (4) I, Arroyo
Lecture-discussion—3 hours; written and/or oral reports. Economic, social, religious, cultural and political development of the Spanish-speaking population of the Southwestern United States from about 1800 to 1910.

169B. Mexican-American History (4) II. Arroyo
Lecture-discussion—3 hours; written and/or oral reports. 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. Analysis of the Revolutionary epoch with emphasis on the structure of British colonial policy, the rise of revolutionary movements, the War for Independence and its consequences, and the Confederation period.

***170C. The Early National Period, 1789-1815** (4) III. Jacobson
Lecture—3 hours. 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. Political and social history of the American republic from the end of the War of 1812 to the Compromise of 1850.

171B. U.S. Civil War: Politics and Society (4) II. Calhoun
Lecture-discussion—3 hours, term paper. Social crisis, 1848-1877: slavery and the West, new political parties, secession, mobilization and emancipation, economic nationalism and Reconstruction (for military aspects, see course 173).

***172. History of the South, 1880-1976** (4) III.
Lecture—3 hours; term paper. History of the South from a regional perspective. Topics include: the Confederate legacy; southern industrial growth, the tenant-share-cropping systems; white social and political supremacy; the southern demagogues; the Freedom Bus rides; the 1970's political re-emergence.

173. U.S. Military and Naval History: the Nineteenth Century (4) III. Calhoun
Lecture-discussion—3 hours; scheduled research-paper consultation. Evolution of techniques and organizations. Major campaigns of the War of 1812, the Mexican War, and the Civil War.

174A. The Emergence of Modern America, 1876-1914 (4) I, III. Marchand, Brody
Lecture—3 hours; term paper. Rise of modern business and labor organizations, changing political institutions, the culmination and decline of Victorian culture, and the reaction of muckrakers, Populists, socialists, feminists and social reformers to industrialization and urbanization.

174B. America in War, Prosperity and Depression, 1914-1945 (4) II. Trotter
Lecture—3 hours; term paper. America's emergence as a world power, the business culture of 1920s, the New Deal and World War II. Emphasis on such issues as government regulation of the economy, welfare capitalism, and class, racial, ethnic and gender conflicts.

174C. The United States Since World War II, 1945 to the Present (4) III. Rosen
Lecture—3 hours; term paper. America's struggle to respond to new complexities in foreign relations, social tensions, family changes and media. Emphasis on such topics as: Cold War; anticommunist crusade; civil rights, feminist and environmentalist movement; New Left; counterculture; Vietnam; Watergate; and the moral majority.

***174D. Selected Themes in Twentieth-Century American History** (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 17B or the equivalent or consent of instructor. Interpretive overview of a single topic in twentieth-century America with emphasis on the phases and processes of historical change.

175A. Intellectual History of the United States (4) I.
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.
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.
Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: courses 17A and 17B or the equivalent; or a course in modern political theory, philosophy, American literature, or sociological theory. Twentieth-century American thought from about 1900 to the 1960s, emphasizing pragmatic liberalism, naturalism in law and literature, protestant liberalism and neo-orthodoxy, Freudian currents in social thought and social criticism of the 1960s.

176A. Social and Cultural History of the United States (4) II. Marchand
Lecture-discussion—3 hours; term paper. Study of social and cultural forces in American society from colonial times through the Civil War with emphasis on social structure, immigration and nativism, racial and occupational groups, social reform movements and changes in social values.

***176B. Social and Cultural History of the United States** (4) III. Rosen
Lecture-discussion—3 hours; term paper and written or oral report. Study of social and cultural forces in American society since the Civil War with emphasis on social structure, immigration, urbanization, labor organizations, racial and national groups, social reform movements and changes in social values.

***176C. Social and Cultural History of the United States** (4) II. 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. Trotter
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 17A, 17B, 27A, 27B strongly recommended. Examination of the political, economic, social, and intellectual history of black people in the United States from 1900 to the present.

***178. American Colleges and Universities** (4) II. Smith
Lecture—3 hours; term paper. A survey of American higher learning from colonial Harvard to the present, emphasizing institutional intellectual life and the role of colleges and universities in their larger society. Tutored term paper; readings of general interest. Offered in even-numbered years.

***179. The Working Class in American Society** (4) I, Brody
Lecture—3 hours; written reports. Prerequisite: course 17B recommended. American labor from the mid-nineteenth century to the present. Social, economic and political forces. Trade unionism and radical movements. Offered in even-numbered years.

***180A. Growth of American Politics to 1815** (4) I, Goodman
Lecture—3 hours; extensive reading and supervised writing. The growth of American politics from the early settlements to 1815 focusing on the distribution of power, its change over time and the ways power has been used. Examines political party development and the social and ideological dimensions of political behavior.

180B. Growth of American Politics, 1815-1890 (4) II. Goodman
Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180A.

***180C. Growth of American Politics, 1890 to the Present** (4) III. Goodman
Lecture—3 hours; extensive reading and supervised writing. Continuation of course 180B.

***183A. The Frontier Experience: Trans-Mississippi West** (4) II. 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) I, 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 in America (4) II. Sherwood
Lecture—3 hours; research paper. Survey of the European background. Study of American scientific institutions, ideas, personalities, creative processes in science, and of relationships between society and science from colonial times to present.

***185B. History of Technology in America** (4) II. Sherwood
Lecture—3 hours; research paper. Study of American technology, emphasizing biographical approach to historical understanding of technological change, creative processes, institutions, ideas, and relationships between technology and society from colonial times to present.

187A. American Business History to the 1880s (4) I, Rothstein
Lecture—3 hours; term paper. Changes in the role of entrepreneurs, organizations, and management practices from the colonial period to the 1880s, with emphasis on the transition from mercantile capitalism to industrial capitalism, marketing, financial intermediaries, and concentration. Offered in even-numbered years.

187B. American Business History, 1880s to the Present (4) II. Rothstein
Lecture—3 hours; term paper. Changes in the role of entrepreneurs, organizations, and management practices from the 1880s to the present, with emphasis on the transition from mercantile capitalism to industrial capitalism, marketing, financial intermediaries, and concentration. Offered in odd-numbered years.

***188A. History of Agriculture in the United States** (4) I, 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) II. 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) I, 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) I, 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.

***190A. 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. Offered in even-numbered years.

NOTE: For key to footnote symbols, see page 123.

190B. 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. Offered in odd-numbered years.

190C. The Chinese Revolution (4) I, Price
Lecture—3 hours; term paper. Analysis of China's cultural and political transformation from Confucian empire into Communist state. Emphasis on emergence and triumph of peasant revolutionary strategy (to 1949), with some attention to its implications for post-revolutionary culture and politics.

191A. Classical China (4) II. Price
Lecture—3 hours; term paper. History of Chinese civilization from its origins through the establishment of city states and the flowering of classical philosophy, to the rise and fall of the First Empire.

***191B. High Imperial China** (4) III. Price
Lecture—3 hours; term paper. Political disunion and the influx of Buddhism; reunification under the great dynasties of T'ang, Sung, and Ming with analysis of society, culture and thought.

192. 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.)

***193. History of the People's Republic of China, 1949 to the Present** (4) III. Liu
Lecture—2 hours; discussion—1 hour; term paper. Comprehensive analysis of recent Chinese history, including land reform, the Cultural Revolution, the post-Mao era, and China's foreign relations from 1949 to the present. Offered in even-numbered years.

***194A. Aristocratic and Feudal Japan** (4) I, Kinmonth
Lecture—3 hours; term paper and/or discussion. Broad survey of the cultural, social, religious, and political aspects of Japanese history from mythological times through the sixteenth century emphasizing comparison of the organizations, values, and beliefs associated with the aristocratic and feudal periods. Offered in odd-numbered years.

194B. Early Modern Japan (4) I, Kinmonth
Lecture—3 hours; term paper and/or discussion. Survey of the cultural, social, economic, and political aspects of Japanese history from the seventeenth through the nineteenth centuries emphasizing the development of those patterns of thought and political organization with which Japan met the challenge of the nineteenth century Western expansionism.

194C. Modern Japan (4) III. Kinmonth
Lecture—3 hours; term paper and/or discussion. Survey of the cultural, social, economic, and political aspects of Japanese history in the twentieth century emphasizing labor and social movements, militarism and the Pacific war, and the emergence of Japan as a major economic power.

194D. Business and Labor in Modern Japan (4) I, Kinmonth
Lecture—3 hours; term paper or papers. A survey of labor and management relations in Japan from the mid-eighteenth century to the present. Offered in even-numbered years.

194E. Education and Technology in Modern Japan (4) I, Kinmonth
Lecture—3 hours; term papers. A survey of education and technology in Japan from the mid-eighteenth century to the present. Offered in odd-numbered years.

***195. Modern China and the West** (4) I, Liu
Lecture—2 hours; discussion—1 hour; term paper. History of European and American relations with China, political, cultural and economic, in the context of East Asian international relations and emphasizing the twentieth century. Offered in odd-numbered years.

197T. Tutoring in History (2) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; laboratory—3 hours. Prerequisite: enrolled as a History major with senior standing and consent of Department Chairperson. Tutoring of students in lower division courses. Weekly meeting with instructors in charge of courses. Written reports on methods and materials required. May be repeated once for credit. No final examination. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201A-L. 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)** China to 1880; **(G)** China since 1880; **(H)** Britain; **(I)** Latin America since 1810; **(J)** American History to 1787; **(K)** United States, 1787-1896; **(L)** United States since 1896;. May be repeated for credit when different subject area is studied.

***202. Social Science in Historical Practice** (4) III. The Staff
Seminar—4 hours. Explores sociological and economic ideas that have actually been used by working historians, especially in United States history, and develops ways to evaluate and plan such efforts.

203. Seminar Research (4) I, II, III. The Staff (Chairperson in charge)
Seminar—3 hours. Prerequisite: consent of instructor. Designed primarily for students preparing for higher degrees in History. Individual research and analysis resulting in substantial research paper. May be repeated for credit.

204A. Historiography (4) I. The Staff (Chairperson in charge)
Seminar—3 hours; research paper. Prerequisite: consent of instructor for non-History graduate students. Introduction to major works of historical scholarship from the Greeks to the present.

204B. New Methods of Historical Research (4) II. The Staff (Chairperson in charge)
Seminar—3 hours; research paper. Prerequisite: consent of instructor for non-History graduate students. Introduction to basic historical data, to the methods currently employed in historical research, and to the problems of presenting findings in a literary form.

***204C. Thematic Seminar** (4) III. The Staff (Chairperson in charge)
Seminar—3 hours; research paper. Prerequisite: consent of instructor for non-History graduate students. Interdisciplinary seminar emphasizing socioeconomic, political and intellectual themes. May be repeated for credit.

***211. Ancient History** (4) I, II.
Seminar—3 hours. Prerequisite: courses 111A, 111B, 111C. Seminar dealing with the various aspects of Near Eastern and Greco-Roman civilization.

***221. Medieval History** (4) I, II. Bowsky
Seminar—3 hours. Prerequisite: courses 121A, 121B, 121C recommended. Topics in the history of medieval and early Renaissance Europe.

***237. Russian History** (4) I.
Seminar—3 hours. Prerequisite: a reading knowledge of Russian. Topics relating to the history of Muscovite and Imperial Russia before 1856.

***242. History of the Enlightenment** (4) III. Schwab
Seminar—3 hours. Prerequisite: a reading knowledge of French. Intellectual and social history of Europe during the Enlightenment. May be repeated for credit.

***245. Modern European History** (4) II. Hagen, Margadant
Seminar—3 hours. Prerequisite: course 201E. Primary sources and research methodologies in the history of modern France and Germany. May be repeated once for credit.

***246. Europe in the Twentieth Century** (4) II. Willis
Seminar—3 hours. Political history of Europe since 1919, with particular emphasis on the post 1939 period.

***251A-*251B. English History** (4-4) II-III.
Seminar—3 hours. Prerequisite: courses 151A, 151B, 151C, 154 reccommended. (Deferred grading only, pending completion of sequence.)

***261. Latin American History** (4) I, II, III. Bauer, Poppino
Seminar—3 hours. Prerequisite: two courses in Latin American history; reading knowledge of Spanish or Portuguese.

***270. Early American History** (4) III. Jacobson
Seminar—3 hours.

***271. History of the United States, 1760-1815** (4) II. Goodman
Seminar—3 hours.

***272. History of the United States, 1815-1848** (4) I, Calhoun
Seminar—3 hours.

273A-273B. Research Seminar in the Comparative History of Women and the Family (4-4) I-II. Rosen
Seminar—3 hours. Research in literature, methods, and historical approaches to the area of women and the family culminating in each student completing a research paper in this field. (Deferred grading only, pending completion of sequence.)

***274. Recent History of the United States** (4) I.
Seminar—3 hours. Topics in twentieth-century American history.

***275. American Social and Intellectual History** (4) I, Smith
Seminar—3 hours. Prerequisite: courses 175A, 175B and 175C or the equivalent; or consent of instructor. Studies in the recent historiography of, or research and writing in, American social and intellectual history. May be repeated for credit.

276. Social History of Science and Technology in America (4) III. 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.

***278A. Seminar: Topics in Afro-American History** (4) I, Trotter
Seminar—3 hours; term papers. Prerequisite: graduate students in history or consent of instructor. Examination of a series of topics (demographic, economic, social, cultural, and political) in Afro-American history from the African background to the present. Particular attention is given historiography, methodology, and problems in research on Afro-American life and history. Offered in even-numbered years. (Deferred grading only, pending completion of sequence.)

***278B. Seminar: Topics in Afro-American History** (4) II. Trotter
Seminar—3 hours; term papers. Prerequisite: graduate students in history or consent of instructor. Examination of series of topics (demographic, economic, social, cultural, and political) in Afro-American history from the African background to the present. Particular attention is given historiography, methodology, and problems in research on Afro-American life and history. Offered in odd-numbered years. (Deferred grading only, pending completion of sequence.)

***279. History of the United States: the Twentieth Century** (4) III. 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) III. Rothstein
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) II, III. Liu, Price
Seminar—3 hours; article-length paper—3 hours. Prerequisite: consent of instructor. Research on topics to be chosen by the students for the purpose of writing article-length papers. May be repeated for credit.

***291C. Chinese History** (4) III. Price
Seminar—3 hours. Prerequisite: reading knowledge of Chinese. Readings in Chinese historical materials. Training in the techniques of using Chinese reference works will be provided.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299D. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

300. The Teaching of History in the Junior College and Secondary Schools (3) I.
Lecture—3 hours. Prerequisite: junior or senior standing with a teaching major or minor in social studies. Methods for the presentation of history at the secondary and junior college level.

390. Teaching History in College (1) I, II, III. The Staff
Discussion—1 hour. Designed for teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the University. (S/U grading only.)

History of Art

See Art

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

NOTE: For key to footnote symbols, see page 123.

sciences, and specialized subject matter, provides an excellent background for professional home economists. Employment opportunities exist in governmental, industrial, and community agencies dealing with social services, private industry, extension services, and teaching at the secondary and community college levels after completion of a one-year credential program. The major encompasses the broad field of family and consumer sciences combining laboratory work with academic theory in such areas as human (child) development, food science, nutrition, and textiles.

Graduates are qualified to enter graduate programs in Child Development and Textiles, or with additional courses in biological sciences, the program in Food Science or Nutrition.

This major also provides academic preparation for those who plan to pursue a teaching credential.

Home Economics

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equal or more comprehensive courses are acceptable. *Courses without parentheses are required.*)

	UNITS
Preparatory Subject Matter	**64-67**
Anthropology, cultural or general sociology (Anthropology 2 or Sociology 3)	4
Biological science (Biological Sciences 1)	5
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Economics (Economics 1A, 1B)	10
Physiology (Physiology 2 or 110)	4-5
Psychology, general (Psychology 1)	4
Statistics (Statistics 13 or Economics 12)	4-5
Textiles and clothing, including properties of fabrics and social/psychological aspects of dress (Textiles and Clothing 6, 7)	7
Written expression and oral expression (see College requirement, page 71)	8
Computer science (Agricultural Science and Management 21 or Sociology 40)	2-3
Depth Subject Matter	**48-49**
Economics, Consumer Economics 141, 142, Applied Behavioral Sciences 165	11
Food and nutrition, Food Science and Technology 100A–100B, Nutrition 101 or 110, plus 111	15
Human development, Human Development 110, and 100A or 100B or 100C	8
Textiles and clothing, Textiles and Clothing 162	3
Plus a specialization, select one from the following:	
(a) Consumer affairs — Agricultural Economics 112, Consumer Science 100, Rhetoric 140 or 141	11
(b) Food and nutrition — Food Science and Technology 101A, 101B, Nutrition 111L, 118, 120	12
(c) Housing and environmental design — Applied Behavioral Sciences 171, Design 134, and 180A or 180B or 180C	12
(d) Human development — Human Development 100A, 100B, 100C, 102, or 103	12
(e) Textiles and clothing — Textiles and Clothing 17, 161 or 163, 161L or 162L or 163L, Design 143	11
Restricted Electives — Additional courses related to the major determined in consultation with adviser.	**29-33**
Unrestricted Electives	**35**
Total Units for the Major	**180**

Major Adviser. B. G. Goldman *(Applied Behavioral Sciences)*.

Advising Center for the major is located in 109 Everson Hall (752-2512).

Graduate Study. See page 94.

Teaching Credential Subject Representative. See under the major in Agricultural Education.

Courses in Home Economics

Lower Division Courses

90. Challenges and Opportunities in Home Economics (1) III. Goldman in charge
Seminar—1 hour. Specialists in selected areas of home economics address current issues facing today's professional including challenges, opportunities, and prospects for appropriately trained university graduates. May be repeated once for credit with consent of instructor. (P/NP grading only.) Offered in even-numbered years.

92. Internship in Home Economics (1-12) I, II, III. The Staff (Goldman in charge)
Laboratory—3-36 hours. Work-learn experience off and on campus in a home economics related area. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

192. Internship in Home Economics (1-12) I, II, III. The Staff (Goldman in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience off and on campus in a home economics related area. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Goldman in charge)
Prerequisite: consent of instructor. Directed group study of selected topics in home economics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Goldman in charge)
Prerequisite: consent of instructor. Directed individual study for advanced undergraduate students. (P/NP grading only.)

Home Economics Education

See Agricultural and Home Economics Education

Horticulture (A Graduate Group)

Anton M. Kofranek, Ph.D., Chairperson of the Group

Group Office, 1045 Wickson Hall

Faculty. The faculty includes departmental members of Environmental Horticulture, Pomology, and Viticulture and Enology.

Graduate Study. The Graduate Group in Horticulture offers programs of study leading to the M.S. degree under the two master's degree options: thesis or comprehensive examination.

Preparation. A level of competence equivalent to that of a sound undergraduate program in Plant Science is required. This includes course work in general botany, chemistry, physics, statistics, genetics and introductory plant physiology. A few limited deficiencies in any of these areas can be made up after admission to the graduate program. Specific requirements are outlined in detail and may be obtained from the Group Office.

Graduate Advisers. Information relative to advisers available in each of the three departments above may be obtained from the Department of Pomology or the Group Office.

Related Courses. Pertinent graduate courses in horticulture may be found by reviewing the Catalog under the departmental categories of Environmental Horticulture, Pomology, Viticulture and Enology, Plant Science, and Plant Physiology.

Course in Horticulture

Graduate Course

290. Seminar (1) I, II, III. Ryugo
Seminar—1 hour. Prerequisite: graduate standing at UCD. Seminars presented by invited speakers, students, or faculty on selected topics in horticulture. (S/U grading only.)

Human Development

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Applied Behavioral Sciences.

The Major Program

Human 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 person, the family, and the community. It is an appropriate major for those planning to pursue advanced degrees in the behavioral sciences and offers course work useful for persons who will later pursue careers in education, child guidance, social welfare, health science related fields, or research in human development.

Human Development majors observe infants, children, and adults in a variety of situations. You may also participate in study projects with people from different socioeconomic and cultural backgrounds who function in a variety of institutional settings (schools, hospitals, mental health clinics, and group foster homes).

Students who anticipate exploring the biological aspects of Human Development should include in their preparatory course work the prerequisites for upper division biological sciences courses.

Human Development

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

	UNITS
Preparatory Subject Matter	**38-42**
Anthropology 1 and 2	8
Biology (Biological Sciences 1 or 10)	4-5
Genetics (Genetics 10, 100, 100B, or 120)	4
Nutrition 10 or 101	3-5
Physiology (Physiology 2, 10, 110)	4-5
Psychology 1 and 15	8
Statistics	4
Human Development 30A-30B	3
Depth Subject Matter	**51-52**
Human Development 100A, 100B, 100C, 110	16
Social-cultural processes (Human Development 102, 103)	4
Assessment (Human Development 120, 121)	4
Cognitive processes (Human Development 101, 132)	3-4
Exceptional children (Human Development 130, 131)	4
Practicum (Human Development 140A, 141, 142)	4

NOTE: For key to footnote symbols, see page 123.

Additional upper division Human Development or related courses from list of restricted electives as determined in consultation with faculty adviser 16

Breadth Subject Matter 20
English or rhetoric, to include at least one upper division course (see College requirement, page 71) 12
American history or political science 8

Unrestricted Electives 66-71

Total Units for the Major 180

Major Adviser. J. N. Welker.

Related Major Program. See the major in Applied Behavioral Sciences (page 141).

Graduate Study. See page 94.

Courses in Human Development

Questions pertaining to the following courses should be directed to the instructor or to the Applied Behavioral Sciences Advising Office in Academic Office Building 4 (752-2244).

Lower Division Courses

12. Human Sexuality (2) I, III. The Staff (Bachtold in charge)
Lecture—2 hours. Vocabulary; structure and function of genital system; sexual response; menstruation; fertility; birth control; pregnancy and childbirth; sex in religion and law; sex education; homosexuality; masturbation; establishing and maintaining intimacy; intimate communication; attitudes and values; sexual dysfunctions; lovemaking. (P/NP grading only.)

15. Family and the Life Cycle (4) II. Welker
Lecture—3 hours; discussion—1 hour. Introduction to scope and methods of Human Development focusing on aspects of socialization (social relations, sex roles, sexuality) in families throughout lifecycle; consideration of impacts on socialization (e.g., minority status, child care, alcoholism); exploration of sources of strength and help. Not open for credit to students who have completed courses 100A, 100B or 110.

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 six months to 5 years; analysis and use of observational data. (Deferred grading only, pending completion of sequence.)

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100A. Infancy and Early Childhood (4) I, Harper. III, Welker
Lecture—3 hours; discussion—1 hour; field observations of preschool children. Prerequisite: introductory psychology and biology. Analysis of the biological, social, and cultural influences in the psychological growth and development of children, prenatal through age six.

100B. Middle Childhood and Adolescence (4) II. Harper
Lecture—4 hours; 3 brief observations of school-age children. Prerequisite: course 100A or the equivalent; introductory biology. Analysis of the interplay of biological and social-cultural factors in the emotional, cognitive and social development from middle childhood through adolescence.

100C. Adulthood (4) III. Hawkes
Lecture—3 hours; discussion—1 hour. Prerequisite: introductory psychology. Biological, cognitive and social psychological aspects of adult development.

101. Cognitive Development (4) II. Kraft
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100A-100B or Psychology 112. Theories of cognitive development including developmental views of perception, learning, memory, concept formation, and language.

102. Social and Personality Development (4) II. Raupp
Lecture—3 hours; discussion—1 hour. Prerequisite: introductory psychology; courses 100A-100B recommended. Theories of the development of a child's personality through his interactions with children and adults. Emphasis on development of interpersonal and culturally valued skills.

103. Cross-Cultural Study of Children (4) III. Werner
Lecture—4 hours. Prerequisite: course 100A or consent of instructor. Cross-cultural studies of children in developing countries and among minority groups in the U.S.

110. Contemporary American Family (4) I, Crockenberg
Lecture—4 hours. Prerequisite: introductory psychology. Factors currently influencing American families including changing economic conditions, changing sex roles, divorce, and parenthood; theories and research on family interaction.

120. Research Methods in Human Development (4) I, Barton
Lecture—2 hours; discussion—2 hours. Prerequisite: courses 100A-100B or the equivalent; elementary statistics. Research in selected areas of human development (i.e., infancy, learning, cognition, socialization, personality).

121. Psychological Assessment (4) II. Barton
Lecture—4 hours. Prerequisite: courses 100A-100B; elementary statistics. Current issues and methodology related to the process of psychological assessment with children.

130. Emotionally Disturbed Children (4) III. Bryant
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100A-100B or consent of instructor. Discussion of psychosis, neurosis, behavior disorders, and learning difficulties in children.

131. Developmental Disabilities (4) I. The Staff
Lecture—4 hours. Prerequisite: course 100A or consent of instructor. Mental retardation and special learning disabilities, etiology, diagnosis, education and socialization. Introduction to community resources.

132. The Gifted (3) III. Kraft
Lecture—3 hours. Prerequisite: courses 100A-100B or consent of instructor. Conceptualization, identification and education of the intellectually and creatively gifted individual.

140A. Laboratory in Early Childhood: Communication and Interaction (4-6) I, II, III. Raupp
Laboratory—12-18 hours. Prerequisite: course 30A or the equivalent for Human Development majors; non-majors and all students electing 5- or 6-unit option must have consent of instructor; course 100A recommended. Communication and interaction modes with children six months to five years of age. Linkage of communication theory with behavior.

140B. Laboratory in Early Childhood: Child-Care Programs (4) I, II, III. Raupp
Lecture—2 hours; discussion—1 hour; laboratory—5 hours. Prerequisite: course 140A and consent of instructor. Interaction with children six months to five years of age in a preschool program. Linkage of child development theory with behavior. Sect. 1, infancy: Sect. 2, program planning and analysis. May be repeated for credit with a change in section.

141. Field Studies with Children and Adolescents (4-6) I, The Staff; II, Crockenberg; III, The Staff
Discussion—2 hours, field study—6-12 hours. Prerequisite: course 100B or the equivalent and consent of instructor. Study of children's affective, cognitive and social development within the context of family/school environments, hospitals and foster group homes. May be repeated for credit for a total of 12 units following consultation with and consent of instructor.

142. Field Studies with Exceptional Children (4-6) III. Bachtold
Discussion—1½ hours; field study—6-12 hours. Prerequisite: consent of instructor and one course from courses 130, 131, or 132 (may be taken concurrently). Field study with children who are identified as developmentally disabled, emotionally distressed, or intellectually gifted. May be repeated for credit for a total of 12 units following consultation with and consent of instructor.

150. Supervision and Administration of Early Childhood Education Programs (4) I, Welker
Lecture—40 hours total. Prerequisite: course 140A or prior experience in an early childhood education program. History of early childhood programs in California; federal, state and local regulations. Implications of different regulations for; funds and budgets; policy making mechanisms; professional and legal responsibilities; staff development; and professional attitudes and issues. Offered in odd-numbered years.

151. Shared Child Care (3) II. Werner
Lecture—3 hours. Prerequisite: one course from courses 100A, 110, Psychology 112, and Sociology 131. Examines role of caregivers in evolutionary past, history, and contemporary society; impact of siblings, relatives, neighbors, family day-care providers, foster parents, and babysitters on children's cognitive and social development. Discusses social policy issues and legislation concerned with shared child care.

190C. Introductory Research Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: involvement in ongoing research. Instructors lead discussions with undergraduate students who involve themselves in a research project. Research papers are reviewed and aspects of project proposals developed out of class are presented and evaluated. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Infant Development (3) III, Crockenberg
Seminar—3 hours. Prerequisite: graduate standing and consent of instructor. Analysis of theory and research on infant development. Emphasizes prenatal and perinatal influences, temperament differences, attachment, cognitive development, the family context, at-risk infants, interventions and research methodology. Offered in even-numbered years.

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) I, Werner
Lecture—2 hours; discussion—1 hour; field project or paper. Prerequisite: graduate standing in Human Development, Education, Anthropology, Psychology or Sociology. Current theory and research concerned with comparative child development. Introduction into the major issues and methods of cross-cultural research (e.g., biological, cognitive and social development of children in different cultures and subcultures in U.S.A.). Offered in odd-numbered years.

***214. Clinical Child Development** (3) I, 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.

***221. Psychological Assessment of Children** (4) II. Barton
Lecture—2 hours; discussion—2 hours. Prerequisite: course 121 or consent of instructor. Study of children's behavior through examination, analysis and evaluation of perceptual-motor, cognitive, affective and social development. Problems in assessment of exceptional children considered. Assignments focus on preparation of a comprehensive report on one child.

231. Issues in Cognitive and Linguistic Development (3) II. Kraft
Seminar—3 hours. Prerequisite: consent of instructor. Study and evaluation of key issues in the theoretical and empirical literature on cognitive and linguistic development.

***237. Parent-Child Interaction** (3) III. Crockenberg
Seminar—3 hours. Prerequisite: consent of instructor; upper division course on the family recommended. Current theory and research. Emphasis on parental behavior in other animals and other cultures, childrearing practices, the child's perception of parents, the differential influence of each parent on the child's psychological well-being, sex-role development, and moral development. Offered in odd-numbered years.

***241. Consultation Approaches to Child Development** (2) I, Bryant
Seminar—2 hours. Prerequisite: course 141 or the equivalent and consent of instructor. Analysis of theories and approaches of consultation and child development to facilitate delivery of child-related services (e.g., educational and mental health services). Offered in even-numbered years.

***241L. Application of Consultation Approaches to Child Development** (3-5) I. Bryant
Discussion—1 hour; field placement—6-12 hours. Prerequisite: course 241 (may be taken concurrently); coursework in theory related to the placement; consent of instructor. Application of theories and approaches of consultation and child development to facilitate delivery of child-related services. Development of consultation skills for working with adults in direct contact with children. Offered in even-numbered years.

290. Seminar (3) I, Barton; II, Bachtold; III, Bryant
Seminar—3 hours. Discussion and evaluation of theories, research, and issues in human development. Different topics each quarter.

290C. Research Conference (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Supervising instructors lead research discussions with their graduate students. Research papers are reviewed and project proposals are presented and evaluated. May be repeated for credit. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

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.)

Immunology (A Graduate Group)

Eli Benjamini, Ph.D., Chairperson of the Group

Group Office, 3146 Medical Sciences-I (752-3156)

Faculty. The faculty includes members from several colleges and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The Graduate Group in Immunology offers programs of study leading to the M.S. and Ph.D. degrees in various aspects of immunology. The Master's degree is offered under the two master's degree options: thesis or comprehensive examination.

Preparation. Applicants for candidacy to these programs should have completed undergraduate preparation in general biology, general bacteriology or microbiology, zoology or botany, general genetics, mathematics, general physics, chemistry, and biochemistry.

For work leading to the Ph.D. degree, the requirements include cell biology, chemical immunology, cellular immunology, immunohematology, developmental immunology and immunogenetics. In addition to these general requirements more specialized preparation in at least one of the following is required: (a) microbiological specialties (bacteriology, virology, parasitology, medical microbiology); (b) zoological specialties (comparative anatomy, endocrinology, embryology, protozoology, histology, cytology, taxonomy, physiology); (c) medical specialties (pathology, anatomy, pharmacology, clinical pathology, reproduction, hematology, radiology, epidemiology); (d) biochemistry/biophysics specialties (biologically active molecules, control mechanisms); (e) genetic specialties (developmental genetics, population genetics, cytogenetics, molecular genetics).

Graduate Adviser. Contact the Group Office.

Individual Major

(Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science)

The Major Program

The Individual Major, an integrated program composed of courses from two or more disciplines, is designed by the student and is subject to approval by faculty advisers and appropriate college committees. This major enables a student to pursue a specific interest which cannot be accommodated within the framework of an existing major. It must clearly and specifically meet the student's educational goals and provide, where appropriate, a basis for the applicant's career objectives as well as meet University and College academic standards.

Proposals for individual majors must be submitted *before the fourth quarter prior to graduation for students registered in the Colleges of Agricultural and Environmental Sciences and Letters and Science, and before the third quarter prior to graduation* for students in the College of Engineering. Specific requirements for each college are shown below. Application forms are available in program offices.

College of Agricultural and Environmental Sciences

(Academic Advising Center)

Program Office, 122 Hoagland Hall (752-0610)

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter ..... Lower division courses basic to the program or needed to satisfy prerequisites for upper division requirements.	**(variable)**
Depth Subject Matter ..... An individualized program of 45 upper division units taken from two or more areas of study (at least one of the areas must be within the College). At least 30 of the 45 units must be taken from courses provided by the College.	**45**
Unrestricted Electives	**(variable)**
Total Units for the Degree	**180**

Additional requirements
At least 54 of the 180 units needed for graduation must be upper division. The College also requires that at least 8 units must be in English and/or Rhetoric courses that emphasize written or oral expression (see page 71).

Major Adviser. H.O. Walker *(Land, Air and Water Resources).* The course of study must be developed in consultation with the Master Adviser, 122 Hoagland Hall, and two or more faculty members prior to final review by the Individual Major Committee for the College.

Students applying for an Individual Major will be admitted into the Exploratory Program.

College of Engineering

(Undergraduate Office)

Program Office, 2132 Bainer Hall (752-0553)

B.S. Major Requirements:

Subject Areas

	(minimum) UNITS
Mathematics (calculus, differential equations, vector analysis)	18
Physical and biological sciences (including at least 10 units of general chemistry and 12 units of physics for engineering and science students)	26
Analytic mechanics and strength of materials	6
Applied thermodynamics	3
Applied electricity and magnetism	5
Properties of materials	4
Engineering design (courses selected from a list developed for Individual Engineering Majors by the Undergraduate Study Committee)	20
Additional upper division engineering courses, exclusive of 199 courses	24
Written and oral expression (courses equivalent to English 1 and either Rhetoric 1 or 3)	8
Humanities-social sciences (from a list of courses and course groups approved by the Undergraduate Study Committee)	24
Additional units to complete 180-unit program (Unrestricted electives, 10 units maximum)	42
Total Units for the Degree	**180**

Student Proposal
To follow this alternative, your complete program of study and a statement of objectives must be received by the College Undergraduate Office prior to the official beginning date of the third quarter preceding graduation. It is to your advantage to submit your proposal well in advance of this deadline (during your junior year) so that any modifications required by the Committee can be made before the beginning of your senior year. Once your curriculum has been approved, changes may be made only for good cause and with the further approval of the Committee. Additional information may be obtained from the Engineering Undergraduate Office. (Also see pages 77-79.)

College of Letters and Science

Martin C.L. Wilson, Program Director

Program Office, 150 Mrak Hall (Dean's Office), (752-0392)

Committee in Charge
Ronald A. Arbini, Ph.D. *(Philosophy)*
Lawrence B. Coleman, Ph.D. *(Physics)*
Vincent A. Crockenberg, Ph.D. *(Education)*
Stephanie A. Shields, Ph.D. *(Psychology)*
Martin C. L. Wilson, Ph.D. *(Zoology)*

A.B. and B.S. Major Requirements:

	UNITS
Preparatory Subject Matter ..... Lower division courses basic to the program or needed to satisfy prerequisites for upper division requirements.	**(variable)**
Depth Subject Matter ..... Upper division units must include: a. interrelated and complementary courses from two or more departments which provide a unified pattern and focus b. at least 30 units from Letters and Science teaching departments or programs; c. no more than 10 units in courses numbered 194H, 198 and 199.	**45-54**
Total Units for Degree	**180**

Student Proposal
A student submits to the Dean's Office his or her major proposal and an essay, discussing educational purposes, personal and/or professional objectives, along with faculty letters of recommendation. After initial review, the Faculty Committee on Individual Majors evaluates the proposal and provides final action.

Major Advisers (selected by student). *Principal Adviser:* a faculty member in a teaching department or program in the College of Letters and Science in major field of emphasis. *Secondary Adviser:* a faculty member from secondary area of interest.

Honors Program.

Toward the end of the junior year, students potentially eligible for highest honors at graduation (see page 92), may petition the Individual Majors Committee for tentative acceptance into an honors program.

Final admission will depend upon the Committee's approval of a senior thesis prospectus that has been agreed upon by the student and faculty adviser. The prospectus must be presented to the Committee during the first quarter of the senior year. Graduation with highest honors will be conditional upon both the maintenance of the required grade-point average and the completion of the senior thesis project. The Committee will consider alteration of the student's original major proposal to allow up to 3 units of independent study during each of the last two quarters of the senior year for work on senior honors thesis.

Integrated Studies

(College of Letters and Science)

Kenneth R. Greider, Ph.D. Program Director
Nora A. McGuinness, M.A., Acting Program Director

Program Office, 816 Sproul Hall (752-3377)

Committee in Charge

Daniel R. Brower, Jr., Ph.D. *(History)*
Richard T. Curley, Ph.D. *(Anthropology)*
Gordon J. Edlin, Ph.D. *(Genetics)*
[2,3]Donald Gibbs, Ph.D. *(Oriental Languages and Civilizations)*

NOTE: For key to footnote symbols, see page 123.

Kenneth R. Greider, Ph.D. *(Physics)*
Bruce Hackett, Ph.D. *(Sociology)*
Arthur E. McGuinness, Ph.D. *(English)*
Nora A. McGuinness, M.A. *(Integrated Studies)*
David A. Robertson, Ph.D. *(English)*
[3,4]G. Thomas Sallee, Ph.D. *(Mathematics)*
Alan A. Stambusky, Ph.D. *(Dramatic Art)*
Mark L. Wheelis, Ph.D. *(Bacteriology)*
Daniel Wick, Ph.D. *(Integrated Studies)*

Faculty

Daniel R. Brower, Jr., Ph.D., Professor *(History)*
Gordon J. Edlin, Ph.D., Professor *(Genetics)*
[2,3]Donald Gibbs, Ph.D., Associate Professor *(Oriental Languages and Civilizations)*
Kenneth R. Greider, Ph.D., Professor *(Physics)*
Bruce Hackett, Ph.D., Associate Professor *(Sociology)*
Nora A. McGuinness, M.A., Adjunct Lecturer
David A. Robertson, Ph.D., Associate Professor *(English)*
Alan A. Stambusky, Ph.D., Professor *(Dramatic Art)*
Daniel Wick, Ph.D., Lecturer

The Program of Study

Integrated Studies is a freshman Honors residential program which introduces freshman 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 its courses count toward the completion of requirements in all three undergraduate colleges. Enrollments are limited in order to keep the class sizes small. (Approximately 100 are admitted to the program. Class sizes are approximately 25-30.)

Students enroll for at least three Integrated Studies courses during the year, as well as the Integrated Studies Seminar each quarter, and two-thirds of the class live in "B Building" of the Tercero dormitory complex.

Courses in Integrated Studies

Lower Division Courses

1A, 1B, 1C, 1D. Ideas and Issues in the Sciences (4) I, II, III, III. The Staff (N. McGuinness in charge)
Lecture—4 hours. Exploration of major developments in the natural sciences and social sciences. Emphasis on the interrelation of the sciences. Themes and fields vary from year to year. For 1984-85 the themes are perspectives on "Civilization and Culture" and "Nature and the Environment." Fields selected are genetics, bacteriology, physics, and sociology of science.

2A, 2B, 2C, 2D, 2E. Ideas and Issues in the Arts (4) I, II, III, II, III. The Staff (N. McGuinness in charge)
Lecture—4 hours. Exploration of major themes and/or major figures in the humanities. Emphasis on the interrelation of history and the arts. Themes and fields will vary from year to year. For 1984-85 the themes are perspectives on "Contemporary Societies" and "Civilization and Culture." Fields selected are drama, history, literature, theology, and twentieth-century European and African culture

8. Colloquium (1) I, II, III. The Staff (N. McGuinness in charge)
Discussion—1 hour. Lectures, films, and readings on the interrelation between the arts and sciences. May be repeated for credit. (P/NP grading only.)

9. Seminar (1) I, II, III. The Staff (N. McGuinness in charge)
Lecture—1 hour. Preparation of a research report. Lectures, films, and readings on the themes for the year. May be repeated for credit. (P/NP grading only.)

Internal Medicine

See Medicine

International Agricultural Development

(College of Agricultural and Environmental Sciences)

The Major Program

Today there is a need for trained individuals who can translate and apply recently developed agricultural knowledge and technology to problems of food production, nutrition, health, income generation, marketing, and asset redistribution in less developed nations. Students interested in contributing to the solution of these problems associated with world hunger and health, as well as growth with equity, may wish to investigate the major in International Agricultural Development. Courses in International Agricultural Development are taught by faculty with extensive experience in developing nations.

The International Agricultural Development major provides opportunities to develop competence in a technical field in agriculture or a social science specialization, and, in addition, to acquire those special qualities of mind and spirit requisite for effective performance in underdeveloped and developing areas of the world. For a career in International Agricultural Development, you must be perceptive, sensitive, tolerant and understanding, and possess knowledge of the social-political-economic-cultural relationships which characterize developing societies and economies. Graduates concerned with issues and problems in international development may find job opportunities in government service, in private voluntary organizations, with commercial and consultant firms, and in multinational development companies working overseas.

International Agricultural Development

B.S. Major Requirements:

(For convenience in program planning, the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**49-50**
Social Sciences core	
Physical science (Chemistry 1A, 1B)	10
Mathematics (Computer Science Engineering 20, Agricultural Science and Management 150)	7
Biological science (Biological Sciences 1, Plant Science 2, Animal Science 1, Nutrition 10, Botany 2, Zoology 2)	12-13
English (see College requirement, page 71)	8
Social sciences (Applied Behavioral Sciences 19, Anthropology 2, Political Science 2, Sociology 1, History 4C)	12
Natural Sciences and Physical Sciences core	
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Physics (Physics 1A or 2A)	3
Mathematics (Mathematics 16A or 21A; Agricultural Science and Management 150)	7-8
Biological science (Biological Sciences 1, Botany 2, Plant Science 2, Animal Science 2, Zoology 2-2L, Bacteriology 2 and 3, Genetics 100A-100B or 120)	15
English (see College requirement, page 71)	8

NOTE: For key to footnote symbols, see page 123.

English (see College requirement, page 71)	8
Depth Subject Matter	**42-44**
International Agricultural Development 10, 100A, 100B, 110A, 110B	15
International Agricultural Development (101, 102, 141, 190, 191, 195, 198)	10
Agricultural economics and economics, Economics 1A-1B and two upper division courses relevant to development (Agricultural Economics 100A, 100B, 106, 113 or 136, 114 or 157, 125, 140, 145, 150, 176; Economics 100, 100M, 110A, 115A, 115B, 118)	18
Primary Field of Specialization†	**60**
Natural Sciences or Social Sciences: Courses chosen by student, with an adviser in that specialization, to include additional preparation required for a particular specialization, depth subject matter, and supporting disciplines.	
Natural Sciences: Student should include some coursework in social sciences appropriate to the geographic area of personal interest (e.g., anthropology, geography, history or political science area studies courses).	
Unrestricted Electives	**26-29**
Students not possessing a reading/speaking ability in a foreign language will be encouraged to use these electives for language study or to attend an intensive language school.	
Total Units for the Major	**180**

Specialization Advisers
A listing of faculty in the various areas of specialization and with interests in International Agricultural Development is available from the Major Adviser.

Major Adviser. O.E. Thompson *(Applied Behavioral Sciences).*

Graduate Study. A program of study and research leading to the M.S. degree is available in International Agricultural Development. Detailed information regarding graduate study may be obtained by writing to the Coordinator of Graduate Recruitment (I.A.D.), Graduate Division, UC Davis.

Graduate Advisers. D.E. Hansen *(Agricultural Economics);* L.E. Grivetti *(Nutrition).*

Related Courses. See Agricultural Economics 125, 148, 215C; Agronomy 21, 111; Animal Science 160; Anthropology 221; Economics 115A-115B, 118, 215A-215B-215C; Geography 142; Nutrition 20; Political Science 185; Sociology 144; Vegetable Crops 150.

Courses in International Agricultural Development

Questions pertaining to the following courses should be directed to the instructor or to the Department of Applied Behavioral Sciences, Advising Center in Academic Office Building 4 (752-2244).

Lower Division Courses

10. Population, Food, and Life; Quality or Subsistence? (3) III. The Staff
Lecture—3 hours. Food requirements versus self-realization as the limiting force in population growth: the interaction of changing human goals and new technology through successive stages in economic development; agriculture's contributions to development.

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Field placement—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

Upper Division Courses

100A. Tropical Agriculture (3) I. The Staff
Lecture—3 hours. Prerequisite: a minimum of 15 units of lower division courses in animal and avian sciences, biological sciences, and soil, plant, and water sciences. Introduction to origin and evolution of tropical agriculture:

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

physical and climatic factors; tropical soils structure and function; nutrient cycling; erosion and desertification; tree crops; irrigation methods; traditional and modern cropping systems; plant protection and pest management.

100B. Tropical Agriculture (3) II. The Staff (Thompson in charge)
Lecture—3 hours. Prerequisite: course 100A. Introduction to tropical agroforestry, aquaculture, animal production and management systems both traditional and modern, interface of tropical agriculture with human nutrition and health, traditional agricultural calendars, and multiple cropping systems.

101. Crop Production under Tropical Conditions (3) II. Mikkelsen (Agronomy and Range Science)
Lecture—2 hours; discussion—1 hour. Prerequisite: Plant Science 2 or Botany 2, and Soil Science 100 or course 100A or Agronomy 100. Environmental and management factors affecting plant agriculture and farming systems in the tropics. Crops considered in relation to shifting cultivation, rice-based cropping systems, annual cropping, polycropping and monoculture of perennial species.

102. Livestock and Poultry Production in Developing Countries (3) I, Vohra (Avian Sciences)
Lecture—3 hours. Prerequisite: course 100B. Animal production and problems of specific countries in Asia, Africa, and South America. Consideration of feed resources, pests, diseases and their control; kinds of animals, domestic, wild and fish suited to these areas; uses of animals for draft and for food.

110A. Agricultural Development: Production (3) I, Parks
Lecture—3 hours. Prerequisite: upper division standing and an agricultural production course. Organization and utilization of human and natural resources in low income countries to produce food and fiber for consumption and trade. Emphasis is on farm management.

110B. Agricultural Development: Marketing (3) II. Parks
Lecture—3 hours. Prerequiste: course 110A or consent of instructor. Postharvest handling, storage, transportation, processing and trade of agricultural products in low income countries. Emphasis upon food marketing systems and development projects.

141. Technology for Agriculture in Developing Regions (3) I, Chancellor (Agricultural Engineering)
Lecture—2 hours; laboratory-discussion—2 hours. Prerequisite: Physics 1A; upper division standing. Equipment used in tropical agriculture. Man-, animal-, and engine-powered devices. Energy requirements, size-scale, costs, support infrastructure development, and productivity potentials. (Same course as Agricultural Engineering Technology 141.)

190. Proseminar in International Agricultural Development (1) I, II, III. The Staff
Seminar—1 hour. Presentation and discusstion of current topics in international agricultural development by visiting lecturers, staff and students. May be repeated for credit. (P/NP grading only.)

191. Topics in International Agricultural Development (3) I, II, III. The Staff
Lecture-discussion—3 hours. Prerequisite: consent of instructor. Selected topics dealing with current issues in agricultural development in lesser developed nations—variable content. May be repeated for credit.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Field placement—3-36 hours. Prerequisite: consent of instructor. Supervised internship, off and on campus, in community and institutional settings. (P/NP grading only.)

195. Field Study in Mexican Agricultural Development (3) I, Hansen (Agricultural Economics)
Field trip—8 days; seminar—four 2-hour sessions. Prerequisite: prior enrollment with consent of instructor required. Knowledge of Spanish not required. Observation of agricultural development strategies and impact on Northwestern Mexico. Discussion with farmers and agency staff members. Study of unique Mexican institutional arrangements and experiences in dealing with agricultural development problems. United States influences on Mexican agriculture. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Analysis of Agro-Ecosystems for Agricultural Change (4) III. Rains (Agronomy and Range Science; Plant Growth Laboratory)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A-100B (or the equivalent) or consent of instructor. Ecosystems analysis applied to major world agricultural ecosystems as a basis for the design and management of agroecosystems for improved agriculture.

201. Analysis of Farming Systems (4) II. The Staff (Graduate Group Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200 or consent of instructor. Analysis of farming systems as basis for understanding farmer behavior, designing improved farming systems, and contributing to design of agricultural policies; investigation of farming practices in a variety of settings and of experiences endeavoring to change farming practices.

202. Social Systems and Agricultural Development (4) II. The Staff (Graduate Group Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division coursework in economic development, cultural anthropology, sociology, or political science (especially comparative politics or public administration), or consent of instructor. Social and cultural factors in agricultural and rural development; adaptation of rural people to development process; agrarian movements and revolution; evaluation of theories of rural development; application of social analysis to design and implementation of rural and agricultural policies and programs.

203. Management Systems for Agricultural Development (4) III. The Staff (Graduate Group Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200, 201, or 202 (preferably 200 or 201), or consent of instructor. Contexts of agricultural and rural development; strategies for program implementation; planning, staffing, and financing agricultural development; processes and structures of implementation; delegation, decentralization, devolution, deconcentration, and dispersal.

290. Seminar in International Agricultural Development (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Discussion and critical evaluation of advanced topics and issues in international agricultural development. (S/U grading only.)

298. Directed Group Study (1-5) I, II, III. The Staff (Graduate Group Chairperson in charge)
Selected topics relevant to advanced study in International Agricultural Development. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Graduate Group Chairperson in charge)
(S/U grading only.)

International Agricultural Development (A Graduate Group)

Donald Nielsen, Ph.D., Chairperson of the Group

Group Office, 122 Hoagland Hall (752-1669)

Faculty. The Group includes faculty from the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science, and the School of Veterinary Medicine.

Graduate Study. The International Agricultural Development M.S. degree program prepares U.S. and foreign students for careers in agricultural and rural development around the world. Many of its faculty members have had worldwide experience in international development.

The philosophy guiding the IAD program is that graduates must have strong preparation in a specific field within the agricultural and social sciences. Thirty different specializations are offered. In addition, to apply their specializations in developing nations, graduates should be perceptive and understanding of people with a comprehension of how technological, social, economic and political variables affect the development process. They should have insight into individual and group motivations and be able to discern ways to initiate changes.

The IAD program provides a multidisciplinary education designed in recognition of these needs. It guides students to the knowledge, skills, and abilities needed to stimulate, assist, or manage agricultural development and enhance rural life in developing countries. Students are prepared to accomplish technological and biological improvement in agricultural methods and to encourage social innovations where appropriate.

Graduate Adviser. Contact the Group Office.

International Relations

(College of Letters and Science)

Paul E. Zinner, Ph.D., Program Director

Program Office, 351 Voorhies Hall (752-3063)

Committee in Charge

Conrad J. Bahre, Ph.D. *(Geography)*
Daniel R. Brower, Jr., Ph.D. *(History)*
David J. Boyd, Ph.D. *(Anthropology)*
Richard T. Curley, Ph.D. *(Anthropology)*
William K. Domke, Ph.D. *(Political Science)*
Donald Gibbs, Ph.D. *(Oriental Languages and Civilizations)*
David E. Hansen, Ph.D. *(Agricultural Economics)*
Elias H. Tuma, Ph.D. *(Economics)*
Paul E. Zinner, Ph.D. *(Political Science)*

The Major Program

Cultural, economic, and political ties bind the world together more closely today than ever before. Problems of security, human rights, energy and mineral resources, and the environment are increasingly confronted at a global, rather than a national level. The challenge of world politics and the growth of international business have created dynamic opportunities for individuals with a background in international affairs. With its theoretical models and real world application, the study of International Relations has become an exciting, rapidly expanding, and highly relevant interdisciplinary major.

The International Relations Program at UC Davis provides a comprehensive approach to the study of today's complex world. This flexible and diverse undergraduate major *is the only one of its kind in the nine-campus University of California system.*

Graduation with a major in International Relations requires completion of introductory courses in political science, economics, geography, and history. Upper division work is composed of a "core" of four courses in economics and political science required of all majors, and an additional set of eight courses chosen from one of four "clusters" which encompass major topical areas in combination with regional emphases: I. World Trade and Development, II. Imperialism and Self-Determination, III. World Resources, IV. World Politics.

The major requires fluency in English and a working knowlege (approximately 26 units of course credits or the equivalent) of one other modern language. The latter must be a language of major significance in international affairs. Students may substitute another foreign language only with International Relations Program Committee approval.

One program of special interest to International Relations majors is the Education Abroad Program ("junior-year abroad"). Students of international affairs have found EAP an invaluable experience, providing insights into the life and culture of individuals in another country.

Students may obtain academic credit for internships under the sponsorship of the International Relations Program Committee. The work-learn program assists students in obtaining internships for academic credit related to their field of study. Legislative, legal, and business internships have proved to be the most popular among International Relations students. The "Davis in D.C." program arranges summer internships in Washington, D.C.

NOTE: For key to footnote symbols, see page 123.

International Relations gives the student a wide range of opportunities for advanced study and for careers in agencies of the federal government—in the U.S. or abroad, state agencies, international or nongovernmental organizations, foundations, newspapers and companies with interests in international business, trade or finance. The stringent language requirement of the major program enhances career prospects in jobs which demand knowledge of the language and culture of other countries.

International Relations

A.B. Major Requirements:

UNITS

Preparatory Subject Matter 25-51
Economics 1A, 1B 10
Political Science 3 4
Geography 10 3
History 4C 4
One course selected from Anthropology 2, History 4B, 7, 9A, 9B, 10, 15, 17B, Political Science 1, 2 4
Approximately 26 units (or the equivalent) in one modern foreign language 0-26
Recommended: one course in statistics, (e.g., Economics 12, Sociology 46A, 46B, Statistics 13)

Depth Subject Matter 48
Political Science 123 4
Political Science 130 4
Economics 115A, 115B 4
Economics 162 (or 160A-160B) 4
(Students who opt to take Economics 160A-160B may count 4 of the units toward fulfillment of an appropriate cluster requirement. Note prerequisite for these courses.)
Cluster emphasis 32
Choose one from the four clusters shown below. Courses must be in addition to those applied toward requirements above.

Total Units for the Major 73-99

Course List for Cluster Emphasis

Cluster I: World Trade and Development
(Heavy economic emphasis; suitable particularly for students who seek careers in international business or international organizations)

Economics 160A-160B
Economics 160A may count toward fulfilling the core requirement, but not as a replacement for Economics 162. Prerequisites for these courses are Economics 100 and 101, or consent of instructor.
One course to be selected from:
Economics 115A or 115B (whichever course is not used to fulfill the core requirement above), 118
Two courses to be selected from:
Anthropology 122, 126, 162
Geography 141, 142
Political Science 124, 178
Sociology 139, 141, 144, 145
Two regional courses from Group A (History)

Cluster II: *Imperialism and Self-Determination*
(Provides students with an opportunity to concentrate on problems of development of the Third World in recent times)

One course to be selected from each of four subjects:
Anthropology 123, 124, 126, 127, 162, 163
Sociology 118, 141, 145
Political Science 117, 124, 126, 127, 178
Economics 110B, 115A or 115B (whichever course is not used to fullfill the core requirement above), 116
Four regional courses:
Select two courses from Group A (History)
Select two courses from Group B (Anthropology, Economics, Geography, Political Science, and Sociology)

Cluster III: *World Resources*
(Designed to familiarize students with major patterns of resource distribution in the world and the role resources play in international affairs):
Three courses to be selected from:
Agricultural Economics 147, 176
Economics 123
Geography 160
Resource Sciences 100
Two additional courses to be selected from at least two of the following groups:
Energy: Agricultural Economics 169 Geology 130 Political Science 171
Food Resources: Geography 142 Sociology 144
Population: Sociology 102, 170
Rural Development: Agricultural Economics 125 Anthropology 126, 141, 162
Urbanization: Anthropology 127 Geography 155 Sociology 143, 145
Water Resources: Geography 162 Geology 116
Three regional courses:
Select two courses from Group A (History)
Select one course from Group B (Anthropology, Economics, Geography, Political Science, and Sociology)

Cluster IV: *World Politics*
(Examines political relationships in international relations. The focus of attention is on national governments and their activities in the global political system)

One course to be selected from:
Political Science 120, 121, 122
Two courses to be selected from:
Economics 116
History 147A, 147C, 168
Political Science 112, 128, 131, 132, 140, 177, 178
Sociology 119
One course to be selected from:
Anthropology 123
Geography 143
Philosophy 117
Sociology 118
Four regional courses:
Select two courses from Group A (History)
Select two courses from Group B (Anthropology, Economics, Geography, Political Science, and Sociology)

Regional Courses—Group A
History 115A, 115B, 115C, 137C, 141,143, 144, 145, 146A, 146B, 151D, 161B, 163B, 165, 166B, 168, 174B, 174C, 190C, 193, 194C, 195

Regional Courses—Group B
Anthropology 135, 136, 139A, 139B, 143, 147, 191
Economics 170, 171, 172, 173
Geography 122A, 122B, 123, 124, 125A, 125B, 126, 127
Political Science 128, 133, 134, 136, 137, 138, 146, 148A, 148B, 149
Sociology 147

Major Adviser. P. E. Zinner *(Political Science).*

Course in International Relations

Upper Division Course

192. International Relations Internship (1-12) I, II, III. The Staff (Committee Chairperson in charge)
Internship—3-36 hours (to be arranged). Prerequisite: upper division standing and consent of instructor. Work experience in international relations, with term paper analyzing the practical experience of the student. (P/NP grading only.)

Italian

(College of Letters and Science)

Department Office (French and Italian), 513 Sproul Hall (752-0830)

Faculty

Alfonso De Petris, *Dottore in Filosofia,* Professor
Dennis J. Dutschke, Ph.D., Associate Professor
Gustavo Foscarini, M.A., Lecturer
[4]Maria I. Manoliu-Manea, Ph.D., Professor

The Major and Minor Programs

The major in Italian is intended to provide a solid language background which will enable the student to pursue specific international job opportunities and to develop an appreciation for Italian language and culture. The program of Italian studies at UCD is small and geared to the individual needs of the student. A full range of courses is offered which satisfies the humanities and fine arts area requirement. The use of Italian is stressed on all levels and a knowledge of the language is required for literature courses which are taught only in Italian. Also offered are literature courses in translation which are intended for those students not majoring in Italian. A course on Italian culture and civilization is also taught in English. Practical experience in education is provided through a teaching program offered in conjunction with the Davis Unified School District; students majoring in Italian are able to teach the language at the high school, under the supervision of a University faculty member.

A degree in Italian provides a well-rounded liberal arts background for graduate studies in the humanities and for a wide range of careers in such areas as civil service, business, travel, library science, and education. Above all, however, it gives the student an opportunity to read some of the greatest literature ever written and to study a country and people which have a uniquely rich culture and history.

A minor in Italian is available to those aware that a knowledge of foreign languages is of vital importance in today's increasingly international world. In every sector of society, language skills enhance our chances of getting jobs and successfully keeping them. In a more general sense, our understanding and appreciation of other cultures is dependent on our ability to perceive them clearly; there is no better means of perceiving a foreign culture than through its own language. Specific career opportunities for those students who have a background in foreign languages are abundant. In addition to the Foreign Service, jobs are available in business and education, both overseas and in the U.S. For example, those wishing to live (for brief or longer periods of time) and work in Italy have a choice of cities: Milan for business, Rome for international concerns in agriculture and nutrition in the F.A.O., and Florence for retail commerce and the arts, just to name a few. In the U.S., foreign owned companies or American companies with interests in the foreign market need qualified people who are also fluent in a foreign language.

Italian

A.B. Major Requirements:

UNITS

Preparatory Subject Matter 0-21
Italian 1, 2, 3, 10A or 10B (or the equivalent) 0-21

Depth Subject Matter 36
Italian 101 and 102 8
Upper division courses in literature, taught in the language 28
Must include at least one course from each of the following literary periods: (a) Early Italian, (b) Renaissance and Baroque, (c) Eighteenth through Twentieth Centuries.
A total of 8 units in literature may be replaced by Italian 107 (highly recommended) and/or by courses in related fields such as history, art history, and music.
Note: All upper division courses are to be chosen in consultation with the major adviser.

Total Units for the Major 36-57

Recommended
One year of college Latin or a Romance Language.

Major Adviser. A. De Petris.

Minor Program Requirements:

UNITS

Italian 20
Language, Italian 101, 102 8
Literature, three courses chosen in consultation with major adviser 12
One course chosen from each of the following three areas: (a) Early Italian Literature, (b) Renaissance and Baroque, and (c) Eighteenth through Twentieth Centuries. (One of the above courses may be replaced by course

NOTE: For key to footnote symbols, see page 123.

107 or by a course of literature in translation offered by the Department).

Prerequisite Credit. Credit will not normally be given for a course if it is prerequisite to a course already successfully completed. Exceptions can be made only by the Department Chairperson.

Honors and Honors Program. The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination. See also pages 63 and 92.

Teaching Credential Subject Representative. A. De Petris. See page 98 for the Teacher Education Program.

Courses in Italian

Lower Division Courses

Students offering high school language preparation as a prerequisite must take a placement test.

1. Elementary Italian (6) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Basic Italian vocabulary and structure, aimed at enabling the student to understand and use standard Italian. (Students who have successfully completed, C – or better, Italian 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Italian (6) I, II, III. The Staff
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1.

3. Intermediate Grammar (6) I, III. The Staff
Discussion—5 hours; laboratory—1 hour. Prerequisite: courses 1 and 2 or the equivalent. Continuation of course 1 and 2 series, basic language preparation.

8A. Italian Conversation (3) I, III. The Staff
Discussion—3 hours. Prerequisite: course 3 or the equivalent. Course designed to offer practice in speaking Italian. May be repeated once for credit. (P/NP grading only.)

8B. Italian Conversation (3) II. The Staff
Discussion—3 hours. Prerequisite: course 8A. Course designed to offer practice in speaking Italian. (P/NP grading only.)

10A. Intermediate Italian (3) I. The Staff
Lecture-discussion—3 hours. Prerequisite: course 3 or the equivalent. Reading and discussion of Italian short stories, newspaper articles, etc., providing an introduction to contemporary Italian society and culture while strengthening the student's command of standard Italian.

10B. Intermediate Italian (3) II. The Staff
Lecture-discussion—3 hours. Prerequisite: course 10A. Continuation of course 10A. Considered the minimum prerequisite for participation in Education Abroad Program.

***25. Italian Literature in Translation** (3) II. The Staff
(Chairperson in charge) Lecture—1 hour; discussion—2 hours. Course intended to acquaint the non-major with representative examples of Italian literature. Selected topics will include major authors, genres, literary periods, movements, or special themes.

98. Directed Group Study (1-5) I, II. The Staff
Primarily intended for lower division students. (P/NP grading only.)

Upper Division Courses

101. Advanced Conversation, Composition, and Grammar (4) I, De Petris
Lecture-discussion—3 hours; weekly essays. Prerequisite: course 10B or consent of instructor.

102. Advanced Conversation, Composition, and Grammar (4) III. De Petris
Lecture-discussion—3 hours; weekly essays. Prerequisite: course 101 or consent of instructor.

107. Survey of Italian Culture and Institutions (4) III. Foscarini
Lecture-discussion—3 hours; term paper. 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.

109. The Image of Man in the Italian Renaissance (4) III. De Petris
Lecture—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Process of progressive naturalization of the concept of man and emphasis upon different perspectives of human autonomy, self-determination and scientific "curiosity," in three parts: (a) Renaissance man and his environment; (b) philosophical thought: the adversary evaluation of the concept of Man; (c) prose and poetry.

***113A. Italian Literature before the Renaissance: from St. Francis to Petrarch** (4) I, Dutschke
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Study of the origins of lyrical forms of Italian literature of the thirteenth and fourteenth centuries. 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) I, Dutschke
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Study of the origins of non-lyrical forms of Italian literature of the thirteenth and fourteenth centuries. *The Divina Commedia* and the development of a prose style (emphasis on Boccaccio's *Decameron*).

***115A. Italian Literature of the Renaissance and the Baroque: from Humanism to Machiavelli** (4) I, De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Development of the Renaissance ideal of man and the subsequent loss of faith in this ideal as evidenced in the work of Lorenzo de' Medici, Poliziano, Ariosto and Machiavelli.

***115B. Italian Literature of the Renaissance and the Baroque: from Cellini to Marino** (4) III. De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 115A. A continued examination into the loss of an ideal. Emphasis on the conflicts in Michelangelo and Tasso leading to Marino, with an excursus on Galileo's role in the formation of a modern library standard.

***118. Italian Literature of the Eighteenth Century** (4) I, De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Development of modern Italian literature. Emphasis on the work of Goldoni, Bettinelli, Baretti, Parini, Alfieri and Vico.

***119. Italian Literature of the Nineteenth Century** (4) II. De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Aspects of Romanticism in Italy; including Manzoni, Verga and *Verismo*.

120A. Italian Literature of the Twentieth Century: The Novel (4) II. Dutschke
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Development of the novel from Svevo to the present. Emphasis on the work of Svevo, Levi, Moravia, Pavese and Vittorini.

***120B. Italian Literature of the Twentieth Century: Poetry and Drama** (4) II. Dutschke
Lecture-discussion—3 hours; term paper. Prerequisite: course 10B or consent of instructor. Italian poetry with emphasis on Hermeticism; the theater of Luigi Pirandello and its role in the development of contemporary Italian drama.

***139A. Italian Literature in English: Early Italian Literature and Dante Alighieri** (4) I, Dutschke
Lecture-discussion—3 hours; term paper. Origin of the Italian Lyric Tradition with emphasis on authors of the Sicilian School, the *Dolce Stil Nuovo*, and *Dante's Vita Nova* and *Divina Commedia*.

***139B. Italian Literature in English: Boccaccio, Petrarch and the Renaissance** (4) II. Dutschke
Lecture-discussion—3 hours; term paper. Petrarch and Boccacio and their relations to the Middle Ages and the Renaissance; the Renaissance, with particular attention to the works of Lorenzo de' Medici, Leonardo da Vinci, Machiavelli, Ariosto, Michelangelo, and Tasso.

***139C. Italian Literature in English: Modern Italian Literature** (4) III. Dutschke
Lecture-discussion—3 hours; term paper. The Romantic Movement in Italy in its relationship to European Romanticism with emphasis on Foscolo, Leopardi and Manzoni (offered in even-numbered years); twentieth-century Italian authors: differing emphasis according to the needs of the students. Offered in odd-numbered years.

***150. Contrastive Analysis of Italian and English** (4) II. Manoliu-Manea
Lecture—3 hours; term paper. Prerequisite: course 3 or the equivalent. Contrasting of the linguistic structures (morphology, phonology, syntax) of the two languages, with particular emphasis on the problems of speakers of either language with the learning of the other. To be taught in English. Offered in odd-numbered years.

194H. Special Study for Honors Students (5) I, II, III. The Staff
Prerequisite: open only to honors students. Guided research leading to an honors paper.

197T. Tutoring in Italian (1-4) I, II, III. De Petris
Prerequisite: upper division standing and consent of instructor. Tutoring in undergraduate courses, including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

197TC. Community Tutoring in Italian (1-5) I, II, III. Foscarini
Discussion—1-2 hours; laboratory—2-4 hours. Prerequisite: consent of instructor. Field experience as Italian tutors or teacher's aides. May be repeated for credit for a total of 10 units. (P/NP grading only.)

198. Directed Group Study (1-4) I, II, III. The Staff (De Petris in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (De Petris in charge)
Prerequisite: consent of instructor. Directed individual study for advanced undergraduate students. (P/NP grading only.)

Japanese

See Oriental Languages and Civilizations

Land, Air and Water Resources

(College of Agricultural and Environmental Sciences)

André E. Läuchli, Ph.D., Chairperson of the Department
Michael J. Singer, Ph.D., Vice Chairperson of the Department

Department Office, 139 Hoagland Hall (752-1406)

Faculty

Hoagland Hall Faculty Office
139 Hoagland Hall (752-1406)

Daniel G. Aldrich, Ph.D., Professor Emeritus *(Soil Science)*
Eugene L. Begg, B.S., Adjunct Lecturer *(Soil Morphology)*
Francis E. Broadbent, Ph.D., Professor *(Soil Microbiology)*
Richard G. Burau, Ph.D., Professor *(Soil Science, Environmental Toxicology)*
[1]John J. Carroll III, Ph.D., Professor *(Meteorology)*
Kinsell L. Coulson, Ph.D., Professor Emeritus *(Meteorology)*
C.C. Delwiche, Ph.D., Professor *(Geobiology)*
Emanuel Epstein, Ph.D., Professor *(Plant Nutrition, Botany)*
Robert G. Flocchini, Ph.D., Associate Professor *(Resource Sciences)*
Richard D. Grotjahn, Ph.D., Assistant Professor *(Atmospheric Science)*
Frank F. Harradine, Ph.D., Professor Emeritus *(Soil Science)*
Gordon L. Huntington, Ph.D., Adjunct Lecturer *(Soil Morphology)*
André E. Läuchli, Ph.D., Professor *(Plant Nutrition)*
Donald N. Munns, Ph.D., Professor *(Soil Science)*
Leonard O. Myrup, Ph.D., Professor *(Meteorology)*
Kyaw Tha Paw-U, Ph.D., Assistant Professor *(Biometeorology)*
H. Michael Reisenauer, Ph.D., Professor *(Soil Science)*
[2,3]Victor V. Rendig, Ph.D., Professor *(Soils and Plant Nutrition)*
Dennis E. Rolston, Ph.D., Professor *(Soil Science)*

NOTE: For key to footnote symbols, see page 123.

Roger H. Shaw, Ph.D., Associate Professor *(Meteorology)*
Michael J. Singer, Ph.D., Associate Professor *(Soil Science)*
Harry O. Walker, Ed.D., Senior Lecturer *(Resource Sciences)*
Bryan C. Weare, Ph.D., Associate Professor *(Meteorology)*
Lynn D. Whittig, Ph.D., Professor *(Soil Science)*

Veihmeyer Hall Faculty Office
113 Veihmeyer Hall (752-0453)

James W. Biggar, Ph.D., Professor *(Water Science)*
Robert H. Burgy, M.S., Professor *(Water Science, Civil Engineering)*
Lloyd D. Doneen, Ph.D., Professor Emeritus *(Water Science and Engineering)*
Donald W. Grimes, Ph.D., Adjunct Lecturer *(Water Science)*
Robert M. Hagan, Ph.D., Professor *(Water Science)*
Delbert W. Henderson, Ph.D., Professor *(Water Science)*
Theodore C. Hsiao, Ph.D., Professor *(Water Science)*
Allen W. Knight, Ph.D., Professor *(Water Science)*
Miguel A. Mariño, Ph.D., Professor *(Water Science, Civil Engineering)*
Robert J. Miller, Ph.D., Adjunct Lecturer *(Water Science)*
Donald R. Nielsen, Ph.D., Professor *(Soil and Water Science)*
William O. Pruitt, Jr., M.S., Adjunct Lecturer *(Water Science)*
Frank E. Robinson, Ph.D., Adjunct Lecturer *(Water Science)*
Anne J. Schneider, J.D., Visiting Lecturer *(Water Science)*
Verne H. Scott, Ph.D., Professor *(Water Science, Civil Engineering)*
Wendy Kuhn Silk, Ph.D., Associate Professor *(Water Science)*
[2]Kenneth K. Tanji, M.S., Professor *(Water Science)*
Wesley W. Wallender, Ph.D., Assistant Professor *(Water Science and Agricultural Engineering)*

Major Programs. Majors offered in the field of resource sciences are Atmospheric Science, Resource Sciences, and Soil and Water Science.

Advising Center is located in 122 Hoagland Hall (752-1669).

Courses. See courses listed under Atmospheric Science, Resource Sciences, Soil Science, and Water Science.

Graduate Study. Graduate work offered in the area of resource sciences is Atmospheric Science, Soil Science, and Water Science. Detailed information can be obtained from graduate advisers for these areas and the *Graduate Announcement*.

Landscape Architecture

(College of Agricultural and Environmental Sciences)

Faculty

See under Department of Environmental Design.

The Major Program

This major prepares students for entrance into the profession of landscape architecture. Landscape architects are primarily involved in the planning and design of land areas where human use requires adaptation or conservation of the environment. The curriculum balances creativity, visual and spatial skills with technological expertise and a thorough background in physical, natural, and social sciences. Students develop proficiency at problem-solving relating to design of parks, urban open spaces, energy-efficient neighborhoods, land reclamation projects, and landscape planning for wilderness and scenic regions, coastal and riparian environments, and other sensitive land areas. A process-oriented approach to design is stressed and environmental and community values are emphasized. Graduates may find jobs in private landscape architectural firms or public agencies and corporations employing landscape architects. The Landscape Architecture major provides the student with excellent preparation for graduate school or career development in a wide range of environmental and design-related fields.

Landscape Architecture

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**49-58**
Biological sciences (Biological Sciences 1, 10)	4-5
Botany (Botany 2, Plant Science 2)	4-5
Chemistry (Chemistry 1A, 10)	4-5
Physics (Physics 1A, 2A, 10)	3-4
English (English 1, 2, 20, 103)	4
Public speaking (Rhetoric 1, 3)	4
Two-dimensional design (Art 16, Design 21, Engineering 4)	3-4
Three-dimensional design (Art 5, 112, 121A, Design 130, 134, 135, 180A, 180C)	4
Earth sciences (Geography 1, Geology 1, 2, Soil Science 10)	3
Economics (Economics 1A, 1B, Agricultural Economics 147)	4-5
Computer science (Computer Science Engineering 8, 20, 29A)	3
Mathematics (Mathematics 16A, 36, Statistics 13, Agricultural Science and Management 150)	3-4
Social science (Anthropology 2, Geography 2, 5, Psychology 1, 16, Sociology 1)	3-5
Humanities elective	3
Depth Subject Matter	**71-75**
Introduction to landscape architecture (Landscape Architecture 40)	3
Landscape architecture studio: introduction, recreational open space, site planning (Landscape Architecture 111, 112, 113)	12
Landscape graphic communication (Landscape Architecture 121)	4
Advanced communication for landscape architecture (Landscape Architecture 122)	4
Introduction to landscape construction, site engineering, construction details and drawings (Landscape Architecture 131, 132, 133, 134)	15
History of landscape architecture (Landscape Architecture 140)	3
Introduction to environmental plants (Environmental Horticulture 6)	3
Taxonomy and ecology of environmental plants (Environmental Horticulture 105)	4
Arboriculture (Environmental Horticulture 133)	4
Plant selection for environmental design (Environmental Horticulture 155)	3
Landscape planting design (Landscape Architecture 156)	4
Landscape architecture studio: planning and analysis, urban and community design (Landscape Architecture 181, 182)	8
Senior project in landscape architecture (Landscape Architecture 193)	1-5
Proseminar, three quarters (Landscape Architecture 190)	3
Breadth Subject Matter	**17-21**
Resource sciences, two upper division courses with approval of adviser	6-8
Ecology (Environmental Studies 100, 110, 114A, 114B, Botany 117, Entomology 104, Zoology 125)	3-5
Environmental awareness (Psychology 144)	4
Related disciplines elective	4
Course to emphasize a discipline peripheral to landscape architecture (Environmental Planning and Management 110, 116, 122, 127, Environmental Studies 126, 161, 171, Agricultural Economics 18, Civil Engineering 1, Design 6)	
Unrestricted Electives	**26-43**
Total Units for the Major	**180**

Major Adviser. M. Francis *(Environmental Design)*.

Advising Center is located in 152 Walker Hall (752-1165).

Graduate Study. See page 94.

Courses in Landscape Architecture

Lower Division Course

40. Introduction to Landscape Architecture (3) I. The Staff
Lecture—3 hours. History, theory, philosophy, techniques and applications of landscape architecture and the analysis, planning, design, and management of outdoor spaces.

Upper Division Courses

111. Landscape Architecture Studio: Introduction (4) I, Thayer
Studio—8 hours; two all-day field trips. Prerequisite: course 40 (may be taken concurrently); Design 21. Introductory studio problems in landscape architectural analysis, planning, design, graphics, and evaluation. Limited enrollment.

112. Landscape Architecture Studio: Recreational Open Space (4) II. Francis
Studio—8 hours; two all-day field trips. Prerequisite: course 111. Open to Landscape Architecture majors only. Studio problems in analysis, planning, design, and management of physical land areas intended for recreational open space use. Emphasis on design of parks, trail corridors, and other outdoor recreation facilities. Limited enrollment.

113. Landscape Architecture Studio: Site Planning (4) III. Thayer
Studio—8 hours; two all-day field trips. Prerequisite: course 112. Open to Landscape Architecture majors only. Studio problems in analysis, planning, and design of intermediate-scale landscape developments involving the siting of structure, design of circulation systems, parking, open spaces, and outdoor facilities. Emphasis on residential, institutional, and commercial site planning for solar/energy conservation.

121. Landscape Graphic Communication (4) II. The Staff
Studio—8 hours; two all-day field trips. Prerequisite: course 111. Studio work in graphic representation of landscapes and landscape architectural plans. Introductory work in sketching, rendering, lettering, sheet layout, color use, and presentation techniques relating to the professional practice of landscape architecture. Limited enrollment.

122. Advanced Communication for Landscape Architecture (4) III. Francis
Studio—8 hours; two all-day field trips. Prerequisite: course 121. Open to Landscape Architecture majors only. Advanced concepts in multimedia and graphic presentation of landscape architecture projects, to include preparation of proposals, reports, audio-visual productions, and mixed-media presentations. Limited enrollment.

131. Landscape Architecture: Introduction (3) I. Deering
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 40 and 111 (may be taken concurrently); Engineering 1 recommended. Open to nonmajors with preference to Landscape Architecture majors. Introductory analysis of materials and methods of construction of landscape developments. Emphasis on mechanical, functional, and aesthetic properties of materials and construction methods in common landscape construction practice.

132. Landscape Construction: Site Engineering (4) II. McCulley
Studio—8 hours; two all-day field trips. Prerequisite: course 131. Topographic and grading problems in landscape engineering: drainage plans, grading plans, spot elevations, road alignment, sections and profiles and cut and fill calculations. Limited enrollment.

133. Landscape Construction: Details (4) III. McCulley
Studio—8 hours; two all-day field trips. Prerequisite: course 132. Open to Landscape Architecture majors only. Advanced study of materials and methods in landscape construction. Emphasis on studio design and integration of details and specifications. Limited enrollment.

134. Landscape Construction: Drawings (4) I. McCulley
Studio—8 hours; two all-day field trips. Prerequisite: course 133. Technical solution of an intensive landscape architectural design problem with emphasis on preparation of production drawings and construction implementation documents. Limited enrollment.

NOTE: For key to footnote symbols, see page 123.

140. History of Landscape Architecture (3) III. Deering
Lecture—3 hours. History of landscape architecture as an art form, technology, and profession. Emphasizes design of gardens and outdoor spaces from prehistoric civilizations to the present.

156. Landscape Planting Design (4) III. The Staff
Studio—8 hours. Prerequisite: course 111, Environmental Horticulture 105, and 155. Application of aesthetic, functional, and horticultural principles to the composition of the planted landscape and the development of planting plans.

181. Landscape Architecture Studio: Planning and Analysis (4) I, Dawson
Studio—8 hours; two all-day field trips. Prerequisite: course 113. Landscape architecture studio to include the solution of large-scale landscape architectural problems with emphasis on landscape planning and analysis methods and environmental concerns. Limited enrollment.

182. Landscape Architecture Studio: Urban and Community Design (4) II. Francis
Studio—8 hours; two all-day field trips. Prerequisite: course 181. Solution of community and urban landscape design problems with emphasis on community and social processes, participatory design methods, and comprehension of behavioral factors relating to urban open space. Limited enrollment.

190. Proseminar in Landscape Architecture (1) I, II, III. The Staff
Seminar—1 hour. Lectures and discussion of critical issues in landscape architecture. May be repeated three times for credit. (P/NP grading only.)

192. Internship in Landscape Architecture (1-12) I, II, III. The Staff
Field experience. Prerequisite: senior standing in Landscape Architecture major. Professional field experience in landscape architecture. May be repeated for a total of 12 units. (P/NP grading only.)

193. Senior Project in Landscape Architecture (1-5) II, III. The Staff
Prerequisite: senior standing in Landscape Architecture major. Directed design/research of a significant landscape architectural project under supervision of instructor. May be repeated for credit. (P/NP grading only.)

197T. Tutoring in Landscape Architecture (1-5) I, II, III. The Staff
Tutoring—3-15 hours. Prerequisite: consent of instructor. Tutoring in landscape architecture courses. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates in Landscape Architecture (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Special study for advanced undergraduates. (P/NP grading only.)

Graduate Courses

290. Graduate Seminar in Landscape Architecture (2) I, II, III. The Staff
Seminar—2 hours. Prerequisite: graduate standing and consent of instructor. Seminar on selected topics in landscape architecture research, analysis, planning, design, communication, or education. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor. Selected problems in landscape architecture research, analysis, planning, design, communication, or education. (S/U grading only.)

299. Directed Individual Research for Graduate Students (1-5) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor. Directed research in landscape architecture for graduate students. (S/U grading only.)

Latin

See Classics

Law, School of

Florian Bartosic, B.C.L., LL.M., Dean of the School
Bruce A. Wolk, J.D., M.S., Associate Dean of the School
Mary Jane Hamilton, J.D., Ph.D., Assistant Dean of the School
Mortimer D. Schwartz, J.D., LL.M., M.S., Associate Dean (Law Library)

Dean's Office, 1011 Martin Luther King, Jr. Hall (752-0243)

Faculty

[2]Homer G. Angelo, J.D., LL.M., Professor
[1]John D. Ayer, J.D., LL.M., Professor
[4]Edward L. Barrett, Jr., J.D., Professor
Florian Bartosic, B.C.L., LL.M., Professor
Antonia E. Bernhard, J.D., Visiting Lecturer
Edgar Bodenheimer, J.U.D., LL.B., Professor Emeritus
Alan E. Brownstein, J.D., Acting Professor
Carol S. Bruch, J.D., Professor
Byron Chell, J.D., Visiting Lecturer
Joel C. Dobris, LL.B., Professor
Harrison C. Dunning, LL.B., Professor
Daniel J. Dykstra, LL.B., S.J.D., Professor
[2]Floyd F. Feeney, LL.B., Professor
Daniel Wm. Fessler, J.D., S.J.D., Professor
Susan F. French, J.D., Professor
Gary S. Goodpaster, J.D., Professor
[4]Sarah D. Gray, Ph.D., Professor
Robert W. Hillman, J.D., Professor
James E. Hogan, LL.B., Professor
Margaret Z. Johns, J.D., Visiting Lecturer
Emma C. Jordan, J.D., Professor
[2]Friedrich K. Juenger, J.D., Professor
Leslie A. Kurtz, J.D., M.A., Acting Professor
[4]Cecilia D. Lannon, J.D., Visiting Lecturer
Pierre R. Loiseaux, LL.B., LL.M., Professor
Jean C. Love, J.D., Professor
[4]Sharon F. Mah, J.D., Associate in Law
John B. Oakley, J.D., Professor
Raymond I. Parnas, J.D., LL.M., S.J.D., Professor
Rex R. Perschbacher, J.D., Acting Professor
John W. Poulos, J.D., Professor
Edward H. Rabin, LL.B., Professor
Mortimer D. Schwartz, J.D., LL.M., M.S., Professor
Richard A. Seltzer, J.D., Visiting Lecturer
Floyd D. Shimomura, J.D., Acting Professor
Daniel L. Simmons, J.D., Professor
James F. Smith, J.D., Visiting Lecturer
Martha S. West, J.D., Acting Professor
Bruce A. Wolk, M.S., J.D., Professor
Janet L. Wright, J.D., Visiting 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 111. The symbols are (I) for Fall Semester and (II) for Spring Semester.

Courses in Law

Professional Curriculum

First Year Courses

200. Introduction to Law (1) I, Love, Oakley
Discussion—1 hour. Introduction to basic concepts of the law, the historical roots of common law and equity, the precedent system in its practical operation, the modes of reasoning used by courts and attorneys, and the fundamentals of statutory interpretation. (S/U grading only.)

201A-201B. Property (3-3) I-II. Dobris, 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, Shimomura
Discussion—3-3 hours. Course examines the sorts of promises that are enforced and the nature of protection given promissory obligations in both commercial and noncommerical transactions. Inquiry is made into the means by which traditional doctrine adjusts—or fails to adjust—to changing social demands. (Deferred grading only, pending completion of sequence.)

203A-203B. Civil Procedure (3-3) I-II. Hogan, Oakley, Perschbacher
Discussion—3-3 hours. Study of the fundamental and recurrent problems in civil actions including the methods used by federal and state courts to resolve civil disputes. Among the topics covered are the relation between federal and state courts; the power of courts over persons, property, and subject matter (jurisdiction); the scope of litigation (joinder of claims and parties); preparation for trial through pleading, discovery, and pretrial; devices for resolving actions and issues before and during trial; functions of judge and jury; and the finality of the trial court's disposition.

204A-204B. Torts (3-3) I-II. Brownstein, Jordan, Kurtz, Love
Discussion—3-3 hours. Course in tort law is designed to familiarize the students with the legal concepts which apply to actions brought by litigants who seek relief for injury. It is thus concerned with intentional and unintentional invasions of personality and property. More specifically, the course seeks to analyze civil actions based upon wrongs carrying labels such as: assault, battery, false imprisonment, negligence, strict liability, defamation, invasion of privacy, misrepresentation, and nuisance. Alternatives to the present tort compensation system are also considered. (Deferred grading only, pending completion of sequence.)

206. Criminal Law (3) I, Goodpaster, Poulos
Discussion—3 hours. Study of the bases and limits of criminal liability. Coverage of the constitutional, statutory, and case law rules which define, limit, and provide defenses to individual liability for the major criminal offenses.

207. Legal Research (1) I, Bernhard
Discussion-laboratory—1 hour. Description of the variety of sources of law and secondary authority. Instruction in their location and use. Graded on basis of weekly self-teaching research drills. No final examination.

208. Legal Writing (2) II. Bernhard, Johns
Lecture—2 hours. Instruction in the form and substance of writing. A variety of law related documents will be discussed and drafted. An experience in oral advocacy will be included. Graded on the basis of the writing and advocacy assignments. No final examination.

Second and Third Year Courses

The second- and third-year courses fall into subject areas as shown here
(a) General courses: 209, 250, 258
(b) Agricultural Law: 222, 229
(c) Business Law: 210, 213, 214, 215, 228, 236, 241, 262, 270, 274
(d) Commercial Law: 216, 237, 243
(e) Constitutional Law: 217, 218, 288
(f) Consumer Law: 253, 266, 269
(g) Criminal Law: 227, 233, 275, 276, 284, 290
(h) Estate Planning: 221, 223, 224
(i) Family Law: 225, 230, 234, 272, 273, 281
(j) International Comparative and Foreign Law: 248, 249, 259, 291, 293
(k) Labor Law: 251, 260, 271, 278, 279, 295
(l) Procedure and Jurisdiction: 219, 242, 246, 283
(m) Property and Environmental Law: 232, 255, 256, 264, 265, 282, 285, 287, 294
(n) Public Law: 231, 235, 261
(o) Skills and Litigation: 211, 263A, 263B, 297, 410A, 410B, 413, 414
(p) Taxation: 220, 238, 245, 247, 254, 268
(q) Topical Survey Courses: 212, 226, 239, 240, 244, 252, 257, 267, 277, 280, 286, 289, 292, 296, 298, 299, 419
(r) Clinical Programs: 420, 425, 440, 450, 455, 460, 470, 480

***209. Legal Imagination** (2)
Discussion—2 hours. Intended for students interested in extensive thinking and writing about the legal system and about their role as lawyers in the system. Students will be expected to write short weekly papers and engage in weekly group discussion of their work. Limited enrollment with preference given to third-year students. (S/U grading only.)

210. Business Reorganization (2) II. Ayer
Discussion—2 hours. Prerequisite: course 243 or consent of instructor. Study of troubled business debtors under Chapter 11 of the Bankruptcy Code. Students will work through the debt problems of a hypothetical public company, from preliminary consultation through to confirmation of a reorganization plan. There will be a master discussion problem, but no casebook. Students will be expected to take the responsibility for researching and presenting solutions to specific aspects of the problem, and to share the responsibility for conducting class sessions.

211. Negotiation and Dispute Resolution (2) I, II. Goodpaster
Seminar—2 hours. Course teaches negotiation, mediation, and arbitration skills and theories. Students will do five or more practice negotiations, mediations, or arbitrations to develop their skill, perception, and personal style. Class discussion and theory development are based on these exercises. Limited enrollment.

NOTE: For key to footnote symbols, see page 123.

212. Law, Medicine and Ethics (2) I, Chell
Discussion—2 hours. Advances in medical technology are now requiring both individuals and society to make choices that simply did not exist several years ago. Course will confront those choices and analyze the nature of considerations involved. Topics examined will be (a) death and dying, including withholding treatment from both the old and newborn and the "right to die," (b) reproduction issues as found in "wrongful life" cases and surrogate parenting, (c) allocation of scarce and costly medical resources and issues of transplantation, and (d) concepts of personal autonomy, substitute decision making, involuntary treatment and behavior control. The goal is to introduce student to the numerous difficult issues (legal, medical, ehtical, philosophical) currently facing society and to examine the nature of conflicts and the differing means of resolving questions presented by our ever advancing technology.

213. Business Organizations 1 (3) I, Fessler
Discussion—3 hours. First fifteen hours of the course devoted to alternatives to incorporation for persons in quest of profit. Examined are the sole proprietorship, general and limited partnerships and joint ventures. Related agency concepts are integrated into this material. Balance of the course concentrates upon "close corporations" with emphasis upon the difficulties of attempting to organize under the corporate concept a venture intended to be owned by few persons.

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 of corporation. Comparative attention is given to the traditional statutory and judge-made legal principles as well as to the rapidly expanding "federal corporation law." Among the areas studied are: the governance of the public issue corporations (its operations through a board of directors, committees and officers); the prerogatives of shareholders in the decision-making process; the increasing importance of the concept of corporate social responsibility; and the impact of federal regulation of the proxy system and sale of securities.

215. Business Associations (4) I, Hillman
Discussion—4 hours. Intended primarily for those students interested in a broad survey of the legal rules and concepts applicable to corporations both closely and publicly held. Topics surveyed include the process of incorporation, the financing of corporations, the role of management, the role of shareholders and the means by which corporate structure can be rendered accountable to the socioeconomic demands of the modern state.

216. Commercial Law (3) II. Loiseaux
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, validity of secured interests against third parties, the relationship between the secured party and debtor during the existence of the debt and enforcement upon default. Enrollment in this course is helpful before, although not a prerequisite to, enrollment in Debtor and Creditor.

217. Constitutional Law I (3) I, Barrett, Poulos
Discussion—3 hours. Separation of powers, including the case and controversy doctrines and powers of the President. Division of powers between the national government and the states. Constitutional limitations on governmental regulations of economic interests and fundamental personal interests under the equal protection and due process clauses.

218. Constitutional Law II (3) II. Goodpaster, Poulos
Discussion—3 hours. The second semester of the general survey course in constitutional law covers the remainder of equal protection, racial and other kinds of unlawful discrimination; procedural due process; the meaning of state action; and freedom of speech, press, and religion.

219. Evidence (4) I, Hogan; II, Wydick
Discussion—4 hours. The rules regarding the admissability of testimonial and documentary proof during the trial of civil and criminal cases, including the concept of relevancy, the hearsay rule, the examination and impeachment of witnesses, the opinion rule, constitutional and statutory privileges.

220. Federal Taxation I (4) I, Wolk; II, Simmons
Discussion—4 hours. A study of the statutory, judicial, and administrative material concerning federal income taxes.

221. Trusts, Wills and Decedents' Estates (3) I, French; II, Wright
Discussion—3 hours. Study of the law of wills and trusts. Course coverage includes: intestate succession; wills; contracts to make wills; will substitutes; intervivos and testamentary private trusts; class gifts, powers of appointment, and the Rule Against Perpetuities; and introduction to charitable trusts.

222. Agricultural Law (3) I, Wright
Discussion—3 hours. Prerequisite: course 220 (may be taken concurrently). Study of the legal problems encountered in advising clients engaged in the production for sale of agricultural products. Coverage includes: operational financing (the Federal Credit System); marketing agreements; regulation of sales under the UCC; commodity futures contracts; agricultural cooperatives; employment regulation. Consideration will also be given to business and tax planning for the agricultural producer.

***223. Estate Planning** (2)
Discussion—2 hours. Prerequisite: courses 221 and 245. Problem course concerning preparation and administration of estate plans.

224. Estate and Gift Taxation and Planning (4) II. Dobris
Discussion—4 hours. Prerequisite: courses 220, 221, Tax and planning aspects of wealth transfers.

225. Marital Property (3) I, Johns; II, Bruch
Discussion—3 hours. The California community property system, marriage, nonmarital cohabitation, antenuptial and related contracts; marriage dissolution and nullity, property, support, and tax consequences of marriage dissolution; marital property settlement agreements.

226. Mass Media Law (2) II. Kurtz
Discussion—2 hours. Course will survey legal issues associated with the mass media. Topics covered will include legal problems of news gathering, the regulation of broadcasting, free press/fair trial, and cable television, and the effect of the new technologies.

227. Criminal Procedure (3) I, Barrett; II, Feeney
Discussion—3 hours. The police function: arrest, search and seizure, electronic surveillance, entrapment, police interrogation and confessions, lineups, the exclusionary rule, the role of counsel. Selected problems in post-arrest phases of the criminal process.

228. Business Planning (3) II. Hillman
Discussion—3 hours. Prerequisite: courses 220, and either courses 213 and 214 or course 215. Consideration of selected problems in business planning.

229. Agricultural Law Seminar (2) II. Wright
Seminar—2 hours. Study of the legal problems resulting from the regulation of domestic and foreign trade in agricultural products and technology. Coverage includes the impact of federal regulation on interstate commerce (preemption doctrine), and international trade agreements.

230. Family Law (Short Course) (2) II. Parnas
Discussion—2 hours. Legal aspects of marriage, the family and dissolution. Among the subjects covered are support, custody, guardianship, patemity, illegitimacy, adoption, birth control, surnames, neglect and dependency. Family law reform in the United States and elsewhere and recent California developments will be included.

231. Legislative Process (2) II. Shimomura
Discussion—2 hours. Basic examination of the legislative branch of federal and state government. Includes the process of enacting legislation, bill drafting, the committee system, the development of legislative history, and the budget formulation process.

232. Real Estate Finance (3) II. Rabin
Discussion—3 hours. Prerequistie: some previous exposure to basic income tax principles recommended. Examination of the problems in the acquisition, financing and development of real estate and of lender remedies and debtor protections in the event of debtor default. The course is strongly oriented toward current California law, and toward the practical application of legal doctrines.

***233. Philosophy of Responsibility and Punishment** (2)
Seminar—2 hours. Interdisciplinary approach to some basic problems of criminal justice, among them the following: (1) the relation between freedom of the human will and the imputation of legal responsibility; (2) justifications and criticisms of the notion of punishment; (3) policies of sentencing; (4) excuses from criminal responsibility, especially mental disease.

234. Family Law Practice (3) II. Lannon, Mah
Seminar—2 hours; clinical—1 hour. Prerequisite: course 225, and course 230 or 272 (concurrently). Combined seminar and clinic to provide marital-legal counseling under the direct supervision of the instructor. Clinical participation required twice during semester. Students also participate in weekly 2-hour seminar which will cover a wide range of topic areas pertaining to family law practice. Limited enrollment. (S/U grading only.)

235. Administrative Law (3) I, Shimomura
Discussion—3 hours. Control of the administrative operations of government, both regulatory operations such as approval or prohibition of business practices and social service operations such as welfare. The powers exercised by administrative agencies, principles governing the exercise of those powers and the legal remedies of persons aggrieved by administrative action will be examined. California as well as federal administrative law will be treated.

236. Securities Regulation (2) II. Hillman
Discussion—2 hours. Prerequisite: courses 213 and 214, or course 215. The primary purpose of this course is to familiarize students with laws and regulations, federal and state, relating to the issuance of and trading in corporate securities. It includes materials pertaining to the scope of the term "securities," the registration of securities, intrastate and private offerings, and civil liability under the Securities Act of 1933 and the Securities Exchange Act of 1934.

237. Commercial Paper (3) II. Jordan
Discussion—3 hours. Course in the law of commercial payment systems covering Articles 3 and 4 of the Uniform Commercial Code. Coverage includes the concepts of negotiability, the liability of parties and the rights of holders of checks and notes. The law of bank deposits and collections and the legal relationship between banks and their customers will be explored. Recent developments in the law of credit cards and electronic fund transfer systems will also be addressed.

238. Income Taxation of Partners and Partnerships (2) II. Simmons
Discussion—2 hours. Prerequisite: course 220. Study of Federal income tax problems encountered in organization and operation of partnerships, including problems created by death or retirement of partner, sale of partnership interest, and distribution of partnership assets.

***239. Admiralty Law** (2)
Discussion—2 hours. Jurisdiction of federal and state courts in admiralty and selected aspects of the law applicable to maritime workers and transactions. Casebook will be used; examination given.

***240. Law of Elections and Political Campaigns** (2)
Discussion—2 hours. Course covers constitutional, statutory, administrative and case law aspects of federal and state elections, including laws relating to primaries, general elections, initiatives, recalls, filing requirements, financial disclosures and conflicts of interest.

241. Legal Accounting (2) II. Ayer
Discussion—2 hours. Introduction to accounting for non-accountants. The goal is to provide background and skill that students may put to work in other law school courses and in practice. Basic concepts will be stressed to assure that accounting fundamentals are understood and that their relation to legal problems may be demonstrated. Students with substantial prior accounting experience (6 credit hours or more) may not enroll in this course.

242. Conflicts of Laws (4) II. Juenger
Discussion—4 hours. Study of transactions with multistate or international contacts. The topics covered include jurisdiction, effect of foreign judgments, and choice of applicable law. Special attention will be given to current theories on the resolution of conflicts problems.

243. Debtor and Creditor (3) I, Ayer
Discussion—3 hours. Prerequisite: commercial law recommended. Course focuses on the rights of debtors and creditors. The first part concentrates upon remedies of unpaid creditors under state law and the protection of debtors through limitations on creditors such as exemption laws. The second part involves a study of the Bankruptcy Code with emphasis upon ordinary bankruptcy.

244. Basic Human Physiology (2) II. Gray (Human Physiology)
Lecture—2 hours. Overall view of the principles of physiology with the object of giving the law student some understanding of the normal functioning of the various organ systems of the human body. (S/U grading only.)

***245. Estate and Gift Taxation** (3)
Discussion—3 hours. Prerequisite: course 220. Study of the federal taxation of gifts, trusts, and estates.

246. Federal Jurisdiction (3) I, Love; II. Oakley
Discussion—3 hours. Survey of federal court system and examination of sources and substance of federal jurisdiction. Attention will be devoted to: (1) parameters of appellate and collateral review of state court decisions in federal courts and of federal question, diversity, and maritime jurisdiction of federal trial courts; (2) justiciability, abstention, sovereign immunity and other constraints on exercise of federal jurisdiction; (3) rules of decision applied in federal courts; (4) dynamics of precedent and authority among federal courts and between federal and state courts; and (5) political factors in exercise of federal jurisdiction.

247. Federal Taxation II (4) I, Simmons
Discussion—4 hours. Prerequisite: course 220. Emphasis on income tax problems of corporations and their shareholders. The class considers problems on the organization, financing, operation, dissolution and reorganization of corporate entities.

248. International Law (3) II. Angelo
Discussion—3 hours. A survey of the fundamental problems in, and methods for carrying out, relations between nations. Research resources will be identified. The course will examine national law systems and the interplay between them, international law, international organizations, and individuals

NOTE: For key to footnote symbols, see page 123.

throughout the world. The shortcomings of the classical system of international law will be examined in the light of emerging problems foreseen for the last part of this century. Such issues include: the role of the developing nations, the growth of international organizations, human rights, control of terrorism, law of the sea and outer space, arms control, and transfer of international technology.

249. Comparative Law (2) II. Juenger
Discussion—2 hours. Comparison of methods and sources of common and civil law; background and structure of the principal civil codes; analysis and study of problems arising in international transactions.

250. Jurisprudence (2) I, Oakley
Seminar—2 hours. Course considers the relationship between justice and law, with special attention to the problem of how judges should decide hard cases where the content of the law is in doubt. To what extent should a judge's personal convictions about justice affect decisions about the legal rights of the parties to a law suit? Does it matter if the judge is dealing with a case in which the controversy concerns the proper interpretation of precedent rather than legislation? Is it any more appropriate for a judge to resolve doubtful cases by appeal to "the public interest" than by appeal to the judge's personal sense of right and wrong? An introductory text and a collection of famous essays will illuminate discussion of these and related issues. Each student will also make one class presentation based on independent reading selected with the assistance of the instructor. Students have the option of writing a paper (which may but need not be an expansion of their class presentation) or taking an examination.

251. Labor Law (3) I, West
Discussion—3 hours. Study of the law, primarily statutory, relating to: (1) employee organization and the establishment of the collective bargaining relationship; (2) the negotiation of the collective bargaining agreement; and (3) the exertion of primary and secondary economic pressure.

***252. Sex-Based Discrimination** (3)
Discussion—3 hours. Course focuses on legal issues raised by legal and social discrimination between men and women, explores a range of potential remedies drawn from constitutional law, statutory enactments, and common law developments. Subject matter areas include sex-based discrimination in family law, employment law, educational opportunity, and criminal law.

253. Products Liability (2) II. Dykstra
Discussion—2 hours. The civil action for harm to the consumer resulting from dangerous and defective products.

254. Tax Practice and Procedure (2) II. Wolk
Discussion—2 hours. Consideration of practice and procedure issues in the administration of the tax laws. Topics will include ethics, administrative rulemaking and rulings, IRS audits and appeals, statutes of limitations, civil penalties, jurisdiction and choice of forum, IRS summons power, jeopardy assessments, the collection process, and criminal tax matters.

255. Land Use Regulation (3) II. Brownstein
Discussion—3 hours. Course content substantially overlaps the material covered in course 256. It also includes additional topics such as rent control, condominium conversions, and the effect of land use regulation on property sale transactions. Students who have had course 256 may not receive credit for course 255. It is anticipated that the two courses will be offered in alternate years.

***256. Land Use Planning** (2)
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. Students who have had course 255 may not receive credit for this course. (It is anticipated that courses 255 and 256 will be offered in alternate years.)

***257. Law and Social Sciences** (2)
Discussion—2 hours. Study of the methodology of social science and its application to law.

258. Professional Responsibility (1) I, Schwartz, Wydick; II, Perschbacher
Discussion—1 hour. Study of ethical duties and responsibilities under the American Bar Association Code of Professional Responsibility, the Model Rules of Professional Conduct, and the Code of Judicial Conduct. Required of all students for graduation. (S/U grading only.)

***259. Law and Institutions of European Communities** (2)
Discussion—3 hours. Study of legal problems of European integration, including the transfer of powers to supranational institutions, their decision making, the role of the Court of the Communities and discussion of selected areas of Community Law.

260. Employment Discrimination (3) II. West
Discussion—3 hours. Consideration of employment discrimination based upon race, color, religion, sex, national origin, alienage, age, handicap, and sexual orientation. Course will focus on Title VII of the Civil Rights Act of 1964, and include coverage of Art. 1981, Art. 1983, the Equal Pay and Age Discrimination Acts. State fair employment laws will also be discussed.

261. Local Government (2) I, Rabin
Discussion—2 hours. Examines selected topics of current interest to California cities and counties. The last time this course was given the topics included: (a) California Tort Claims Act, (b) Administrative Procedure Act, (c) antitrust liability of local governments, (d) eminent domain law, and (e) section 1983 (civil rights actions) against local governments. Course is particularly useful for persons who may work for city attorneys or county counsels.

262. Antitrust (3) I, Wydick
Discussion—3 hours. Study of the federal antitrust laws including price fixing, limits on distribution, tying arrangements, monopolization and mergers.

263A. Trial Practice I (3) I, II. Seltzer
Discussion—2 hours; laboratory—1 hour. Prerequisite: course 219 (may be taken concurrently). Introduction to the preparation and trial of cases, featuring lectures, videotapes, demonstrations, assigned readings and forensic drills. Limited enrollment. (S/U grading only.)

263B. Trial Practice II (2) II. Seltzer
Prerequisite: course 263A. Advanced trial practice and litigation skills course featuring student preparation of and participation in mock trials with occasional class sessions. (S/U grading only.)

264. Water Law (3) I, Dunning
Discussion—3 hours. Property rights in water, protection of instream uses of water, legal aspects of water development projects, interstate and state-federal disputes over water, groundwater management, and legal aspects of water-based recreation. Emphasis is placed upon California water law and water development.

265. Seminar in Natural Resources Law (2) II. Dunning
Seminar—2 hours. Prerequisite: two courses from courses 255, 256, 264, 282, 285, and 287; or consent of instructor. Examination of important contemporary issues in the field of natural resources law. Each student selects one such issue for development within the seminar and is expected to prepare a substantial research paper on that issue. No final examination.

266. Food Law (2) I, Loiseaux, Schweigert
Discussion—2 hours. Legal and scientific issues involved in regulation of the nation's food supply and nutritional status. Philosophy and principles underlying the regulatory statutes are approached through consideration of cases, statutes and administrative regulations. Emphasis will be placed upon critical sources of information necessary for effective communication with government on public food policy formation. The U.S. Food and Drug Administration will be of central focus, but Departments of Agriculture and Commerce as well as state rules will also be covered.

***267. Civil Rights Litigation** (2)
Discussion—2 hours. Course will survey racial patterns in American Law. Course coverage will include the following: history of racial discrimination, racial discrimination in public facilities, voting, the administration of criminal justice, public schools, housing, and employment. In addition, this course will consider the remedies for racial discrimination, including actions under: 42 U.S.C.A. Art. 1981, 1982, 1983, and 1985; the Civil Rights Act of 1964, Title VI (programs receiving federal aid), Title VII (employment); The Voting Rights Act of 1965.

268. Taxation of International Transactions (2) I, Wright
Seminar—2 hours. Prerequisite: course 220 or consent of instructor. Analysis of the manner in which the United States taxes foreign source income and income of foreign corporations and aliens. Consideration will be given to the foreign tax credit, tax treaties, the use of controlled foreign corporation as an avoidance device, and tax incentives for export of U.S. products (i.e., the foreign sales corporations).

269. Consumer Protection (2) I, Bernhard
Discussion—2 hours. Study of selected consumer law problems, including a survey of state and federal regulatory efforts. Course coverage may include the following: common law and statutory approaches to fraudulent or deceptive practices, disclosure of information, consumer credit regulation, equal credit opportunity legislation, quality standards, enforcement by the creditor, consumer remedies, and attorney fees for representing consumers.

270. International Business Transactions (2) I, Hillman
Seminar—2 hours. Consideration of selected problems in international business transactions.

271. Labor Law Seminar (2) II. Bartosic
Seminar—2 hours. Study of critical current questions, including cases pending before the Supreme Court, law reform, impasse resolution in the public and private sectors, union authority and individual rights, the rights of the unorganized, the assumptions and myths of American Labor law, labor relations of multinational corporations, and comparative industrial democracy ("paternalism," work councils, codetermination and self-management).

272. Family Law (Long Course) (3) II. Bruch
Discussion—3 hours. Designed for the student with a substantial interest in Family Law and Children and the Law. It covers in depth material offered in the basic (short) course and in addition treats the child and education.

273. Current Issues in Family and Marital Property Law (2) II. Bruch
Seminar—2 hours. Prerequisite: course 225, course 230 or 272, or consent of instructor. Examination in depth of important current issues in the fields of family law and marital property. Heavy emphasis on law reform, including study and direct observation of the legislative process. Each student will select one issue for development and presentation in the seminar. A research paper or draft bill and supporting analysis is required. A more lengthy paper with additional unit credit may be arranged with consent of instructor to satisfy the legal writing requirement.

274. Unfair Trade Practices (2) I, Kurtz
Discussion—2 hours. Study of unfair competition and the protection of intellectual property. Among the topics considered are trade secrets, patents, trademarks, misleading and false advertising, disparagement, and copyrights.

275. The Law of Sentencing and Corrections (2) II. Poulos
Discussion—2 hours. Study of sentencing alternatives including probation and imprisonment. Emphasis will be on rights of prisoners and post conviction remedies. Course aids will include a text, guest speakers, and field trips.

276. Juvenile Justice Process (2) I, Parnas
Discussion—2 hours. Legal and philosophical bases of a separate juvenile justice process; police investigation, apprehension and diversion; probation intake and detention; juvenile court hearing and disposition; juvenile corrections. Major emphasis is on the emerging role of counsel at each phase of the process. Guest speakers and field trips.

***277. American Indian Law** (2)
Discussion—2 hours. Study of the distinctive legal doctrines relating to Indians, Indian tribes, and Indian reservations. Major focus will be on the governmental powers of federal, state and tribal governments over Indians and over non-Indians residing on or doing business on Indian reservations. Casebook will be used; examination given.

***278. Union Authority and Individual Rights** (2)
Seminar—2 hours. Study of the role of law in promoting union democracy, including the legal bases for judicial intervention in internal union affairs, compulsory unionism, the right to admission and fair representation, civil liberties of members, disciplinary proceedings, financial administration, election of officers, trusteeships, racketeering and political activities. Limited enrollment.

279. Public Sector Labor Law (2) II. West
Seminar—2 hours. Prerequisite: course 251 or consent of instructor. Application of private sector labor law doctrines to the public sector. Emphasis is on the four California public sector statutes and the impact of constitutional law on public employees. Class presentation; seminar paper.

***280. Advanced Legal Writing Seminar** (2) I, Parnas; II, Wydick
Seminar—2 hours. How to write a variety of legal documents in plain English. Writing exercises and outside readings will be assigned weekly. Each student will complete an individual writing project in lieu of final examination. The writing project will satisfy the law school's advanced legal writing requirements. Limited enrollment. (S/U grading only.)

281. Children and the Law (2) I, Bruch
Seminar—2 hours. Prerequisite: course 230 or 272 or consent of instructor. 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; legal capacity and emancipation. Research paper or examination. A more lengthy paper with additional unit credit may be arranged with consent of instructor to satisfy the legal writing requirement.

***282. Energy Law** (2)
Discussion—2 hours. Introduction to statutory, administrative and common law of energy resources, including regulation of electric and gas utilities. Water, coal, oil, natural gas, uranium, solar and geothermal fuel cycles will be considered, as will legal aspects of energy conservation.

283. Remedies (3) II. Love
Discussion—3 hours. Study of common law remedies: damages, specific performance, injunctions, and restitutionary relief. Focus of course will be on the efficiency, fairness, and practicality of the alternative remedies available to the practitioner and the court.

284. Advanced Criminal Procedure (3) I, Parnas
Discussion—3 hours. Essential to those who wish to handle criminal cases. In particular, it treats bail, prosecutorial discretion, plea bargaining, trial by jury, and sentencing.

NOTE: For key to footnote symbols, see page 123.

285. Environmental Law (3) II. Dunning
Discussion—3 hours. Introduction to law dealing with environmental protection and pollution control. Emphasis with regard to generic environmental protection legislation is placed upon the National Environmental Policy Act and the California Environmental Quality Act. Emphasis with regard to pollution control legislation is placed upon the Clean Water Act, The Clean Air Act and legislation on hazardous wastes (including "Superfund").

***286. Economics and the Law** (2)
Seminar—2 hours. Examination of a number of legal issues using economic analysis. Possible topics include: the economic impact of different liability rules; economic considerations in contract law; some economics of pollution control; and the purposes and impact of the antitrust laws. No prior background in economics necessary.

287. Public Land Law (2) I, Dunning
Discussion—2 hours. Legal aspects of federal land management, including the history of public land law, authority over federal lands and specialized law dealing with particular natural resources and uses found on federal lands (mining, timber, range, wildlife, recreation and preservation).

288. Advanced Constitutional Law Seminar (2) I, Brownstein
Seminar—2 hours. In-depth analysis of the case law interpreting the equal protection clause with special emphasis on different theoretical approaches which attempt to explain and/or direct judical decisions in this area. Problems relating to intermediate-level scrutiny, legislative motive and purpose and "reverse" discrimination will receive particular attention. If time permits, the form and scope of remedies available to courts to respond to equal protection violations will also be discussed.

***289. Law and Poverty** (2)
Discussion—2 hours. Selective study of the processes, institutions, laws and practices which produce, maintain, exacerbate, regulate, or otherwise affect the conditions of being poor, together with an examination of the role of law and the lawyer in ending poverty, its sustaining conditions, and effects.

***290. Criminal Justice Administration Seminar** (2) I, Feeney
Seminar—2 hours. Prerequisite: course 227 recommended. Consideration of current reform efforts in criminal justice administration. Emphasis will be on the pre-trial process. Specified topics will include bail reform and pre-trial detention, criminal discovery, and the charging process.

291. Private and Public Law of Outer Space (2) II. Angelo
Seminar—2 hours. Study of the emerging legal order for the exploration and use of this new frontier. Space is rapidly becoming the stage for expanding commercial and governmental use. It is an arena in which science, technology, and the law bear a close relationship. An interdisciplinary approach to the growth of this new law with focus on the application of maritime, aviation, and communications rules to space-faring and space use.

292. Immigration Law and Procedure (3) I, Smith
Seminar—3 hours. Course will survey a brief history of the U.S. immigration and policy and comparing the policies of other countries; use of primary and secondary sources and immigration law; federal agency interrelationship (Justice and State Department); entry of nonimmigrant (temporary) visitors and immigrants into the United States; the world wide quota and preference systems; family and employment relationships critical to securing favored immigrant status; deportation procedures; discretionary relief available to persons otherwise subject to deportation; available defenses to deportation and exclusion proceedings; refugee and asylum law; administrative appeals; federal and state judicial relief; citizenship and naturalization. Students may also participate in mock deportation and asylum hearings.

***293. Legal Aspects of International Efforts to Preserve the Earth and Space** (3)
Seminar—3 hours. Recognizing that environmental problems cross national boundaries, participants will examine the imperfect international and emerging network of inter-nation treaties on the environment. Participants will be directed to research sources on items of special interest to them, such as the United Nations Environment Program which has emerged from the 1972 Stockholm Conference, the recently concluded Law of the Seas Convention, remedies for transfrontier pollution, international energy transactions, and regional environmental programs, such as in the European Community, Asia, and Africa.

294. Private Land Use Planning Arrangements Seminar (2) II. French
Seminar—2 hours. Easements, covenants and equitable servitudes as the basis for condominium, time-share, and planned unit developments, for subdivisions with homeowner associations, conservation and historic preservation efforts, and for commercial shopping center and industrial park developments.

***295. Labor Arbitration** (2)
Discussion—2 hours. Prerequisite: course 251. Study of the labor arbitration process and the manner in which various provisions of collective bargaining agreements are interpreted and applied.

***296. Copyright and Entertainment Law** (3)
Discussion—3 hours. First half of course will involve a detailed consideration of the law of copyright, with emphasis on its application to motion pictures, music, television, and theatre. Second half of course will involve a study of other legal problems in the entertainment industry, including misappropriation, protection of titles, characters, group names, and slogans, the rights of privacy and publicity, and the structuring of contracts in the entertainment field.

297. Pre-Trial Skills (2) I, Johns, West
Discussion—2 hours. Course uses a series of role-playing exercises and class discussion to introduce students to a set of non-trial skills basic to the practice of law. Course concentrates on client interviewing and counseling but also includes exercises in other pre-trial skills, including witness interviewing, negotiation, case construction, drafting pleadings, discovery and motion practice. Course is highly recommended for those students who expect to participate in clinical programs. Limited enrollment. (S/U grading only.)

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 an individual paper or an approved alternative growing out of the seminar subject to the faculty board; (7) S/U grading basis only unless the entire group requests letter grades in advance.

299. Research in Legal Problems (1-4) I, II. The Staff
Students may receive credit for individual research projects, subject to the following regulations: (1) project may extend over no more than two semesters; (2) each project will be under the supervision of a faculty member (normally, no faculty member will be permitted to supervise more than 5 students working on individual programs during any semester); (3) an outline of the project must be approved by the supervising faculty member in advance of the semester in which it is to be undertaken; (4) student must submit an individual paper or approved alternative to the supervising faculty member.

Professional Courses

410A-410B. Appellate Advocacy (Moot Court) (1-1) I-II. Perschbacher
Prerequisite: course 410A is a prerequistie for 410B. Both semesters must be taken in order to qualify for interschool competitions. Program includes classroom instruction in appellate procedure and appellate advocacy skills and participation in the moot court program. In the first semester participants work on three oral advocacy problems and argue six times before a moot court. In the second semester participants research and write an appellate brief and then argue the case twice before a moot court. Limited enrollment. (S/U grading only.)

413. Interschool Competition (1-3) I, II. The Staff
Prerequisite: course 410A-410B and consent of appropriate faculty adviser. Participation in interschool moot court and lawyering skills competitions. Enrollment is limited to students actually representing the School in the interschool competitions. Competition must be authorized by the appropriate faculty adviser. The faculty adviser may condition the award of academic credit for any particular competition on the performance of such additional work as may be reasonable to justify the credit. (S/U grading only.)

414. Moot Court Board (1) I, II. The Staff
Prerequisite: course 410A-410B. Members of Moot Court Board may receive one credit for each semester of service on Board, up to maximum of two. Credit awarded only after certification by Moot Court Board and approval of the faculty advisers to Moot Court Board. Limited enrollment. (S/U grading only.)

416. *Law Review* Writer (1) I; (2) II. The Staff
Writing of a publishable law review article under the editorial supervision of editors of the *Law Review.* Minimum of 30 hours contribution to the *Review's* publication is also required. Credit may be obtained only upon achieving status as a Member of the Law Review, which requires that the student have made substantial progress toward completing a publishable article. Credit is awarded only after certification by the Editor-in-Chief of the *Law Review* and approval of the faculty advisers to the Law Review. One unit of credit is earned the first semester and two units the second. (S/U grading only.)

417. *Law Review* Editor (2) I, II. The Staff
Editors must have completed a publishable article and must perform editorial duties requiring a substantial time commitment. Credit is awarded only after certification by the Editor-in-Chief of the *Law Review* and approval of the faculty advisers to the *Law Review.* Editors of the *Law Review* may receive two units for each semester of service as an editor, up to a maximum of four units. (S/U grading only.)

419. Advanced Writing Project (1-4) I, II. The Staff
Completion of a writing project under the active and regular supervision of a faculty member in satisfaction of the legal writing requirement. The writing project must be an individually authored work of rigorous intellectual effort of at least 20 typewritten, double-spaced pages, excluding footnotes. Project may take any of several forms, for example, a paper, a brief, a memorandum of law, a proposed statute, a statutory scheme or set of administrative regulations (with explanatory comments), or a will or agreement (with explanatory comments). The advanced writing project may also be undertaken in connection with another course or seminar to satisfy the legal writing requirement. The number of units for the writing project shall be approved by the faculty supervisor and will depend upon the scope of the writing effort. (Grading may be on S/U or letter-grade basis at the faculty superviser's discretion.)

420. Individual Clinicals (2-12) I, II. The Staff
Clinical program. Prerequisite: relevant substantive and procedural courses recommended. Students may arrange individual clinical programs with practicing attorneys and public agencies of their choice with the approval of the Clinical Committee and under the sponsorship of individual faculty members. A detailed outline of the proposed clinical work, endorsed by the sponsoring faculty member, should be submitted to the Clinical Office one month prior to the beginning of the semester in which credit is requested. The clinical must be under appropriate legal supervision and designed to maximize educational benefits. With the exception of a clinical semester away, a student may enroll in no more than six units of individual clinical study in any one semester or any one clinical placement. Four office hours are required per unit per week. A full time clinical semester may be taken for 12 units; one course may be taken in conjunction with a clinical semester away with the consent of the Dean, receiving not more than 14 total semester units during such a semester. Students arranging individual clinical in subject matter areas covered by Formal Clinical Programs (e.g., criminal justice, legislative, prison, immigration) must enroll in the Formal Clinical Program and attend the required seminars (See Law 234, 440, 460, 470, and 480). For a more complete description of the policies and procedure governing the design, approval, requirements and limitations of individual clinicals, please see the "Clinical Guidelines" obtainable from the Dean's Office or clinical office. (S/U grading only.)

425. Judicial Clinicals (2-12) I, II. The Staff
Clinical Program—to be arranged. Prerequisite: relevant substantive and procedural courses recommended. Students may arrange individual judicial clerkship clinical programs with state and federal judges of their choice with the approval of the Clinical Committee and under the sponsorship of individual faculty members. An introductory orientation seminar is required. Otherwise, the requirements for the program are the same as for Individual Clinicals (course 420). (S/U grading only.)

440. Clinical Program in Immigration Law (4-12) I, II. Smith
Clinical program. Prerequisite: consent of instructor. Client clinic course will include a seminar on immigration law practice, individual weekly case conferences with faculty supervisor and assigned immigration law cases. Students may represent clients in administrative law hearings in San Francisco. Limited enrollment. (S/U grading only.)

450. Clinical Program in Environmental Law (2-6) I, II. Dunning
Clinical Program. Practical experience in environmental law. Students will work under the direct supervision of a government or private lawyer engaged in some form of environmental law work for a minimum of 8 office hours per week. (For purpose of this course, "environmental law" includes land use control by public means.) Students will also be required to prepare a bi-weekly journal, noting, commenting upon, and reflecting upon their clinical experience. May be repeated for a total of 6 units. (S/U grading only.)

455. Clinical Program in Employment Relations (2-12) I, II. West
Prerequisite: course 251 or 260. Clinical Program. This clinic will provide practical experience in employment relations, including private and public sector labor law, agricultural labor law, and employment discrimination. Students will work under the direct supervision of a government or private lawyer engaged in one of these areas of employment law for a minimum of 8 office hours per week. Students will have the opportunity to participate in a full range of activities associated with their specific office, with emphasis on ob-

NOTE: For key to footnote symbols, see page 123.

servation and participation in actual investigation, interviewing, drafting of pleadings, and attendance at hearings. Weekly journals and attendance at monthly small group meetings are required. Limited enrollment. (S/U grading only.)

460. Clinical Program in the Legislative Process (2-4) II. Parnas
Clinical Program. Prerequisite: course 231 recommended. This program is designed to provide students with practical experience in the operation of the office of a legislator or a legislative committee for 7 to 14 hours per week. The major thrust of the program is to enable students to become familiar with the give and take realities of the process of making laws as contrasted with their interpretation and enforcement. Journals and seminar attendance are required. (S/U grading only.)

470. Clinical Program in the Administration of Criminal Justice (4-12) I, II. Parnis
Clinical program. Prerequisite: courses 219, 227 and 263A recommended. This program affords students the opportunity to gain practical experience working full or part time in a District Attorney's or Public Defender's office in one of several surrounding counties for a minimum of 13 office hours per week. Students enrolled in the program engage in the full range of activities associated with their specific office with emphasis on observation and participation in factual investigation, interviewing, counseling, negotiating, motion practice, and trials under State Bar rules. Journals and seminar attendance are required. Limited enrollment. May be repeated for a total of 12 units. (S/U grading only.)

***480. Legal Problems of the Prison Inmate** (2-4)
Clinical program; student/instructor case conference—1 session per week; evening seminar—1 session per week. Students help prisoners at Vacaville and Folsom prisons with civil and criminal law problems. Student is primarily responsible for handling the case from initial interview to completion. Weekly case conference with instructor; and weekly evening seminar/workshop on prison law. There is usually the opportunity to tour a prison and observe or participate in a hearing before the Board of Prison Terms. Goals of course are: basic knowledge of prison law and practical skills in handling a case for a prisoner client. Limited enrollment. May be repeated for a total of 8 units. (S/U grading only.)

495. Instruction in Legal Research and Writing Skills (2) I, II. The Staff
Prerequisite: course 207 or 208. Participants will assist in instructing legal research and writing program for first-year students under the direction of the legal research and writing instructors. Approval of the research and writing instructors required for enrollment. Participants may assist once in the legal research program and once in the legal writing program. (S/U grading only.)

Linguistics

(College of Letters and Science)

Lenora A. Timm, Ph.D., Program Director

Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

Wilbur A. Benware, Ph.D. *(German)*
James Gallant, Ph.D. *(Russian)*
[4]Maria I. Manoliu-Manea, Ph.D. *(French)*
Winfried Schleiner, Ph.D. *(English)*
Lenora A. Timm, Ph.D. *(Linguistics)*
Robert VanValin, Jr., Ph.D. *(Linguistics)*

Faculty

Ronald A. Arbini, Ph.D., Associate Professor *(Philosophy)*
Jarvis R. Bastian, Ph.D., Associate Professor *(Psychology)*
Wilbur A. Benware, Ph.D., Associate Professor *(German)*
Jeanette Blomberg, Ph.D., Lecturer *(Linguistics)*
Linnea C. Ehri, Ph.D., Professor *(Education)*
James Gallant, Ph.D., Associate Professor *(Russian)*
Wayne Harsh, Ph.D., Professor *(Linguistics, English)*
Eduardo Hernández-Chávez, Ph.D., Lecturer *(Linguistics)*
Jeri J. Jaeger, Ph.D., Lecturer *(Linguistics)*
[4]Maria I. Manoliu-Manea, Ph.D., Professor *(French)*
Barbara J. Merino, Ph.D., Assistant Professor *(Education)*
Michael T. Motley, Ph.D., Associate Professor *(Rhetoric)*
David L. Olmsted, Ph.D., Professor *(Anthropology)*
Daniel Rancour-Laferrimère, Ph.D., Associate Professor *(Russian)*
Winfried Schleiner, Ph.D., Associate Professor *(English)*
Gwendolyn Schwabe, M.A., Lecturer *(English)*
Janet S. Shibamoto, Ph.D., Assistant Professor *(Oriental Languages and Civilizations)*
Susan B. Shimanoff, Ph.D., Assistant Professor *(Rhetoric)*
Lenora A. Timm, Ph.D., Associate Professor
Máximo Torreblanca, Ph.D., Professor *(Spanish)*
Robert VanValin, Jr., Ph.D., Assistant Professor
Carolyn F. Wall, Ph.D., Associate Professor *(Anthropology)*
Benjamin E. Wallacker, Ph.D., Professor *(Oriental Languages and Civilizations)*

The Major Program

The discipline of linguistics encompasses a broad spectrum of knowledge about human language. Linguistics focuses on the description of contemporary languages and the study of language change through time. It also has important applications within many other disciplines such as anthropology, biology, communications, education, language teaching, literature, philosophy, psychology, and sociology.

The major is designed to familiarize students with the methods of linguistic analysis at gradually accelerated levels of methodological and theoretical complexity through a sequence of "core" courses. Elective courses allow the student to explore areas which overlap linguistics'.

Linguistics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**24-34**
Linguistics 1 or 135	4
Foreign language, 20 units of Greek or Latin; *or* 22 units of any other language; *or* 30 units of two different languages	20-30
Depth Subject Matter	**40**
Linguistics 109, 110, 139, 140	16
Linguistics 111 or 165	4
Linguistics 102 or 112	4
Oriental Languages and Civilizations 100 or Anthropology 220 (see page 90 for procedures governing undergraduate enrollment in a graduate course)	4
At least 12 upper division units from the following courses: Anthropology 120; Education 117B; English 105A, 105B; French 159, 160; Human Development 101; Italian 150; Linguistics 135 (if not used as an alternate to course 1 above), any other linguistics course not included in the 24-unit requirement above; Philosophy 137; Psychology 132; Rhetoric 105, 107; Russian 160; Spanish 131, 132, 133	12
The student should note that a number of these courses have prerequisites. Since it is usual to select some emphasis within the Linguistics major (e.g., anthropology, a foreign language, etc.) such prerequisites should be completed as a matter of course.	
Total Units for the Major	**64-74**

Major Advisers. W.A. Benware, L.A. Timm, C.F. Wall.

Minor Program Requirements:

The minor in Linguistics is designed to provide the student with a basic knowledge of linguistic analysis. It would be appropriate for students interested in any aspect of language use.

	UNITS
Linguistics	**24**
Linguistics 1, 109, 110 or 139, and 140	16
Additional units of upper division Linguistics courses, chosen in consultation with an adviser	8

Minor Advisers. Same as Major advisers.

Graduate Study. The Linguistics Graduate Group offers study and research leading to the M.A. degree. Detailed information may be obtained from the Graduate Adviser or from the Chairperson of the Linguistics Group.

Graduate Advisers. L.A. Timm, R. VanValin.

Courses in Linguistics

Lower Division Courses

1. Introduction to Linguistics (4) I, II, III. Timm, VanValin, Benware, Wallacker
Lecture—3 hours; laboratory—1 hour. Introduction to the study of language; its nature, diversity, and structure.

Upper Division Courses

***102. Historical Linguistics** (4) I. Benware.
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 109. Description and methods of the historical study of language; sound change, morphological change, syntactic change, semantic change.

105. German Phonology-Morphology (4) III. Benware
Discussion—3 hours; written or oral report. Prerequisite: German 4; course 1 recommended. Modern German phonetics and the structure of the phonological system. Elementary morphological analysis. Offered in odd-numbered years. (Same course as German 105.)

106. History of the German Language (4) III. Benware
Discussion—3 hours; written reports. Prerequisite: course 1 or German 105 recommended. Survey of the development of the German language and study of its structure in historical perspective. Offered in even-numbered years. (Same course as German 106.)

***107. Special Topics in English Language** (4) I, Schleiner, Harsh
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 Linguistic Analysis (4) II. Olmsted, Shibamoto
Lecture—3 hours: discussion—1 hour. Prerequisite: course 109. Introduction to phonemic theory, morphophonemics, morphemics, and tactics. (Same course as Anthropology 110.)

111. Intermediate Linguistic Analysis (4) III. Olmsted
Lecture—3 hours: discussion—1 hour. Prerequisite: course 110. Continuation of course 110. More advanced work in phonemics, morphophonemics, morphemics, and tactics. (Same course as Anthropology 111.)

112. Comparative Linguistics (4) I, Olmsted
Lecture—3 hours: discussion—1 hour. Prerequisite: course 110. Linguistic prehistory, historical linguistics, and reconstruction. (Same course as Anthropology 112.)

113. Language and Sex (4) III. Timm, Shibamoto
Lecture—3 hours: discussion—1 hour. Prerequisite: course 1 recommended. Investigation of real and putative (stereotyped) sex-linked differences in language structure and usage, with a consideration of some social and psychological consequences of such differences. Focus is on English, but other languages are also discussed.

114. The Ethnography of Speaking (4) I, Shibamoto, Wall
Lecture—3 hours: discussion—1 hour. Prerequisite: Anthropology 2; Anthropology 4 or course 1. Social and linguistic aspects of verbal behavior. Participants, situations, and functions of communication. Speech communities, language and social stratification, bi- and multilingualism. (Same course as Anthropology 114.)

115. Chicano Sociolinguistics (3) II. Hernández-Chávez
Lecture—3 hours. Prerequisite: course 1 and Spanish 3 or the equivalent. Study of the varieties of Chicano Spanish spoken in the Southwest. Patterns of Spanish-English bilingualism; attitudes about Spanish and English; Chicano Spanish and the schools.

120. Semantics (4) II. Gallant, Manoliu-Manea
Lecture—3 hours: discussion—1 hour. Prerequisite: course

NOTE: For key to footnote symbols, see page 123.

1 or consent of instructor. Introduction to the study of meaning: the nature of the linguistic sign, the structure of the lexicon, and the semantics of sentences. Offered in odd-numbered years.

***135. Perspectives on Linguistic Research** (4) II. Timm
Lecture—3 hours: discussion—1 hour; term paper. Prerequisite: upper division or graduate standing plus familiarity with at least one language other than English. Overview of the field of linguistics and its relation to allied disciplines. Techniques of linguistic analysis will be presented and applied to natural languages. (Only 2 units of credit will be granted to students who have taken course 1.)

138. Language Development (4) II. Jaeger
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) III. Jaeger
Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. Introduction to and application of phonological theory.

140. Grammatical Analysis (4) I, VanValin
Lecture—4 hours. Prerequisite: course 1. Introduction to syntactic analysis; survey of types of syntactic and semantic phenomena in natural languages. Emphasis will be on developing skills and data analysis, rather than on investigating formal aspects of the theoretical framework to be employed.

***146. The IndoEuropean 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. Hernández-Chávez
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and Spanish 3 or the equivalent. Comparison of the linguistic structures (phonology, morphology and syntax) of Spanish and English; learning problems of both native Spanish and native English speakers will be considered.

165. Introduction to Generative Grammar (4) II. VanValin
Lecture—3 hours: discussion—1 hour. Prerequisite: courses 1 and 140. Introduction to the theory of generative grammar, formalization; goals of linguistic theory; linquistic universals; word and sentence structure, relations between syntax and semantics.

170. Language Universals and Typology (4) II. VanValin
Lecture—3 hours; term paper. Prerequisite: courses 1, 140, and 165 (may be taken concurrently). Investigation into common features of all human languages and the classification of languages in terms of their structural features; theories of universal grammar; detailed discussion of a non-Indo-European language and comparison with English. Offered in odd-numbered years.

192. Internship in Linguistics (1-12) I, II, III. The Staff (Timm in charge)
Internship—3-36 hours; two written reports. Prerequisite: course 1 or the equivalent. Internship applying linguistic-related skills to a fieldwork project in areas such as media, law, or industry, in approved organizations or institutions. Maximum of 4 units applicable toward major. (P/NP grading only.)

***196. Stylistics** (4) II. 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.)

197T. Tutoring in Linguistics (1-4) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper division standing with Linguistics major and consent of Department Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

198. Directed Group Study (1-5) II, III. The Staff (Chairperson in charge)
Prerequisite: senior standing in Linguistics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Timm in charge)
(P/NP grading only.)

Graduate Courses

***200. Gothic** (4) I, Benware
Seminar—3 hours. Knowledge of Modern German not required. Phonology, grammar and reading of Gothic texts. Special topics including the relationship of Gothic to Indo-European and to the other Germanic languages. Offered in even-numbered years.

202. Principles of Historical Linguistics (4) II. Benware, Manoliu-Manea
Seminar—3 hours. Prerequisite: course 102 or 112. Advanced treatment of the theory and methods of historical linguistics.

205. History of the German Language (4) I, Benware
Seminar—3 hours. The development of the German language with emphasis on the early periods, from Indo-European to Middle High German. (Same course as German 205.)

***215. Computational Linguistics** (2) III. The Staff
Lecture—2 hours. Prerequisite: consent of instructor. The use of electronic computers and other computational devices in linguistic analysis, mechanical translation, and lexicography.

***220. Romance Linguistics** (4) I, Manoliu-Manea
Seminar—3 hours. Prerequisite: one course from the following: courses 112, 139, 140. The development of the major Romance languages from Proto-Romance to the modern era. Selected topics in the structure of modern Romance languages. Option of focus on phenology, syntax or historical linguistics.

225. Modern Linguistic Theory (4) III. VanValin
Seminar—3 hours. Prerequisite: courses 165 and 140. Survey of leading contributions to linguistic theory from de Saussure to the present.

250A-D. Topics in Linguistic Theory and Methods (4) I. The Staff
Seminar—3 hours; paper. Prerequisite: graduate standing and consent of instructor. Introduction to current research in various aspects of linguistics.

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Timm in charge)
(S/U grading only.)

Professional Course

300. The Teaching of English as a Foreign Language (4) I, Schwabe
Lecture—3 hours; laboratory—3 hours. Prerequisite: English 105A or course 109. Methods of teaching English to nonnative speakers, stressing particularly recent linguistic methodology and techniques.

Linguistics (A Graduate Group)

Lenora A. Timm, Ph.D., Chairperson of the Group (752-6701)

Group Office, 912 Sproul Hall (752-1219/6701)

Faculty. The Group includes faculty from nine departments in the College of Letters and Science.

Graduate Study. The Graduate Group in Linguistics offers a program of study leading to the M.A. degree with emphasis in one of the following areas: (a) theoretical linguistics, (b) sociolinguistics, (c) child language development, (d) psycholinguistics, (e) linguistic description (contemporary or historical) of a particular language or group of languages. The group also offers a program leading to a certificate in Teaching English to Speakers of Other Languages (TESOL).

In general, the M.A. in Linguistics at UCD is intended to serve as preparation for advanced graduate work at the Ph.D. level, as a supplement to studies in related fields—especially anthropology, psychology, philosophy, the various languages, or as a major component in the training for a professional career (such as TESOL, speech therapy, and foreign language teaching). The program is structured so as to place considerable emphasis on interdisciplinary studies, thereby increasing the breadth of the candidate's knowledge, and providing a wider and more flexible variety of options to pursue thereafter.

Preparation. Applicants to the program who do not have a bachelor's degree in Linguistics must complete the following courses in Linguistics from the undergraduate program: 109 (phonetics), 110 (elementary linguistic analysis), 111 (intermediate linguistic analysis), 102 or 112 (historical or comparative linguistics), 139 (phonological analysis), 140 (grammatical analysis), and 165 (introduction to generative grammar).

Requirements. Thirty units of upper division and graduate coursework above and beyond the courses listed under Preparation (above) are required; 16 of these units must be graduate units chosen from the following: Linguistics 202 (principles of historical linguistics), 225 (modern linguistic theory), Anthropology 220 (field methods in linguistics) and either Linguistics 220 or 250 or Anthropology 292 (Romance linguistics, topics in linguistic theory, or anthropological linguistics).

Additional requirements include (1) a reading examination in a foreign language, and (2) a thesis.

Graduate Advisers. R. VanValin (*Linguistics*, 752-7555), or the Group Chairperson.

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

40. Homer and the Tradition of Ancient Epic
41. Greek Tragedy

*139B. Greek Literature in Translation
*141. Greek and Roman Comedy
*142. Greek and Roman Novel

Comparative Literature

1. Great Books of Western Civilization: From Myth to Faith
2. Great Books of Western Civilization: From Faith to Reason
3. Great Books of Western Civilization: The Modern Crisis
4. The Short Story and Novella
5. Fairy Tales, Fables and Parables
6. Myths and Legends
7. Literature of Fantasy and the Supernatural
8. Utopias and their Transformations

10A-N. Master Authors of World Literature
*13. Dramatic Literature
*15. The Spiritual Quest
*20. Man and the Natural World
135. Women Writers
159A-G. Special Topics in Comparative Literature
*160A. The Modern Novel
160B. The Modern Drama
*161A. Tragedy
*161B. Comedy
*161C. Tragicomedy
*163. Biography and Autobiography
164A. The Middle Ages
*164B. The Renaissance
*164C. Baroque and Neoclassicism
164D. The Enlightenment
166A. The Epic
166B. The Novel
167. Comparative Study of Major Authors
*168A-C. Modern Literary Movements and Styles
169. The Avant-Garde

Dramatic Art

20. Introduction to Dramatic Art
156. Theatre and Drama: Aeschylus to Machiavelli
157. Theatre and Drama: Shakespeare to Schiller
158. Theatre and Drama: Ibsen to Albee
159. Contemporary Experimental Theatre and Drama

East Asian Studies

1. Modern Chinese Literature

NOTE: For key to footnote symbols, see page 123.

English

171A. The Bible as Literature: The Old Testament
171B. The Bible as Literature: Prophets and New Testament.

French

25. French Literature in Translation
150. Masterpieces of French Literature

German

*48. Myth and Saga in the Germanic Cultures
50. Survey of German Culture
*51. Masterworks of German Literature I
*52. Masterworks of German Literature II
*110. Older German Literature
*111. Studies of Major Writers from the Seventeenth to the Twentieth Century
*112. Special Topics in German Literature
113. Goethe's *Faust*
*114. Hermann Hesse
115A. German Literature since 1945
*115B. German Literature since 1945

Italian

*25. Italian Literature in Translation
*139A. Early Italian Literature and Dante Alighieri
*139B. Boccaccio, Petrarch and the Renaissance
*139C. Modern Italian Literature

Russian

30. Great Russian Writers
41. Survey of Nineteenth-Century Russian Literature
42. Survey of Twentieth-Century Russian Literature
121. Nineteenth-Century Russian Prose
123. Twentieth-Century Russian Prose
126. The Russian Theater
140. Dostoevsky
141. Tolstoy
150. Russian Culture
154. Russian Folklore

Scandinavian

110. Masterworks of Scandinavian Literature in Translation

Spanish

34. Mexico in Its Literature
35. Survey of Mexican Culture
149. Latin-American Literature in Translation
150. Masterpieces of Spanish Literature

Master of Education (A Graduate Group)

Mary C. Regan, Ph.D., Chairperson of the Group

Group Office, 124 Academic Office Building-4 (752-2244)

Faculty. This interdisciplinary graduate group consists of a wide array of faculty from departments such as Applied Behavioral Sciences, Nutrition, Textiles and Clothing, Agricultural Economics, Agronomy and Range Science, Environmental Design, Community Health, Plant and Animal Sciences, Agricultural Engineering, Environmental Horticulture, and Pharmacology.

Graduate Study. The Master of Education Graduate Group is housed in the Department of Applied Behavioral Sciences. The program of study involves three areas of specialization: (a) agricultural sciences, (b) consumer studies, and (c) family and social organizational studies. Individual students focus on a specialty area gaining expertise in various subdisciplines of their interest. Generally students are preparing themselves for leadership and professional roles in research, planning, implementation, and evaluation of educational or other institutional programs.

Requirements. Students should submit a Program Plan in the area of intended specialization by the end of the first quarter of graduate study. To complete the Master of Education degree, 36 units (minimum) of upper division and graduate courses must be successfully completed. A minimum of 18 of these units must be graduate-level courses (200 series). Three core courses are required for graduation as well as completion of at least 8 units related to research and/or statistics. A field project and comprehensive oral examination is the final phase for completion of this degree.

Graduate Advisers. M.C. Regan *(Applied Behavioral Sciences)*, O.E. Thompson *(Applied Behavioral Sciences)*, M.A. Morris *(Textiles and Clothing)*.

Mathematics

(College of Letters and Science)

Carlos R. Borges, Ph.D., Chairperson of the Department

G. Thomas Sallee, Ph.D., Vice-Chairperson of the Department

Department Office, 565 Kerr Hall (752-0827)

Faculty

Henry L. Alder, Ph.D., Professor
Hubert A. Arnold, Ph.D., Associate Professor Emeritus
George A. Baker, Ph.D., Professor Emeritus
Dallas O. Banks, Ph.D., Professor
[2]David W. Barnette, Ph.D., Professor
Donald C. Benson, Ph.D., Professor Emeritus
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
Angela Y. Cheer, Ph.D., Assistant Professor
Doyle O. Cutler, Ph.D., Associate Professor
James R. Diederich, Ph.D., Associate Professor
Allan L. Edelson, Ph.D., Professor
Curtis M. Fulton, Ph.D., Professor Emeritus
[3]Robert D. Glauz, Ph.D., Professor
Shirley A. Goldman, M.S., Lecturer
Alan M. Hastings, Ph.D., Associate Professor
Charles A. Hayes, Jr., Ph.D., Professor Emeritus
Frederick A. Howes, Ph.D., Professor
Kurt Kreith, Ph.D., Professor
Arthur J. Krener, Ph.D., Professor
[2,3]Melven R. Krom, Ph.D., Professor
Gary J. Kurowski, Ph.D., Professor
Marc S. Mangel, Ph.D., Associate Professor
David G. Mead, Ph.D., Professor
E. O. Milton, Ph.D., Associate Professor
Donald A. Norton, Ph.D., Associate Professor
Washek F. Pfeffer, Ph.D., Professor
Richard E. Plant, Ph.D., Associate Professor
Edward B. Roessler, Ph.D., Professor Emeritus
[3,4]G. Thomas Sallee, Ph.D., Professor
Evelyn M. Silvia, Ph.D., Associate Professor
Sherman K. Stein, Litt.D. (hon.), Ph.D., Professor
Robert W. Stringall, Ph.D., Associate Professor
Takayuki Tamura, D.Sc., Professor Emeritus
Craig A. Tracy, Ph.D., Professor
Edward J. Tully, Jr., Ph.D., Associate Professor
Howard J. Weiner, Ph.D., Professor

The Major Programs

Students majoring in mathematics may follow a program leading to either the Bachelor of Arts or the Bachelor of Science degree. The latter is especially recommended for students who intend to pursue mathematics at the graduate level. Under either degree program the student may prepare for various careers by an appropriate choice of elective courses.

Developing an ability to think and communicate in mathematical terms is the basic objective of both 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 provides an excellent background for entry into the Schools of Administration, Law, Medicine, or Veterinary Medicine and for graduate study in many other areas. Mathematics is also fine preparation for employment immediately after graduation, since the completion of a mathematics major is taken by many employers as evidence that an applicant can think and learn, two attributes highly prized in an employee. Also, as more and more fields become quantified and scientific, a strong background in mathematics will be required of persons to make meaningful contributions and to reach the top.

Mathematics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**28-31**
Mathematics 11 (or high school equivalent)	0-3
Mathematics 21A, 21B, 21C, 22A, 22B, 36	21
(Strongly recommended that course 36 be taken during freshman year; it must be taken before Mathematics 108.)	
Computer Science Engineering 8	3
Choose according to Track selected (see Depth Subject Matter)	4
Track 1: Physics 8A	
Track 2: Statistics 13 or 102	
Depth Subject Matter	**36-42**
Mathematics 108 (should be taken prior to junior year), 115A	6
Choose one Track from the following two	30-36

Track 1: Secondary Teaching

Mathematics 141
Choose one course sequence from each of (a), (b), and (c)
- (a) Mathematics 121A-121B or 127A-127B
- (b) Mathematics 139A-139B-167 or 151A-151B-151C
- (c) Statistics 130A-130B, or Mathematics 131 and Statistics 131B, or Statistics 131A-131B

Additional upper division mathematics to total minimum of 36 upper division units (0-4)
Recommended: Mathematics 140, 143, 168, Computer Science Engineering 123, Electrical and Computer Engineering 180.

Track 2: General Mathematics

Choose one course sequence from each of (a), (b), and (c)
- (a) Mathematics 115B-115C or 139A-139B or 151A-151B
- (b) Mathematics 118A-118B or 121A-121B or 127A-127B
- (c) Mathematics 140 or 143

Additional upper division mathematics to total minimum of 36 upper division units (11-15)
Recommended: Additional units in computer science.

Total Units for the Major	**64-73**

Mathematics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**28-39**
Mathematics 11 (for high school equivalent)	0-3
Mathematics 21A, 21B, 21C, 22A, 22B	18
Computer Science Engineering 8	3

NOTE: For key to footnote symbols, see page 123.

Choose according to Track selected (see Depth Subject Matter) 7-15
- Track 1: Mathematics 22C, Physics 8A, 8B, 8C
- Track 2: Mathematics 22C, Physics 8A, 8B, 8C
- Track 3: Mathematics 36, Physics 8A
- Track 4: Mathematics 36, Statistics 13 or 102

Note: Strongly recommended that course 36 be taken during the freshman year; it must be taken before Mathematics 108.

Depth Subject Matter 45-54

Mathematics 108 (should be taken prior to junior year) 3

Choose one Track from the following four 42-51

Track 1: Preparation for Graduate Study in Mathematics

Mathematics 126, 127A, 127B, 127C, 151A, 151B, 151C, 185A-185B

Additional upper division mathematics to total minimum of 45 upper division units (9)

Recommended: Mathematics 118A, 118B, 119, 141, 147

Track 2: Applied Mathematics

Mathematics 118A, 118B, 119, 128A, 167

Choose one course sequence from each of (a), (b), and (c)
- (a) Mathematics 121A-121B or 127A-127B-127C
- (b) Mathematics 128B or 128C
- (c) Mathematics 140 or 143

Related upper division units (7-13) from one of the following areas: engineering, computer science, life sciences, or some other physical science (not mathematics). To be developed in consultation with adviser. Note that prerequisites to upper division courses should be taken early in program. Sets of courses are available from an Applied Mathematics adviser.

Track 3: Mathematics for Secondary Teaching

Mathematics 115A, 141

Choose one course sequence from each of (a), (b), and (c)
- (a) Mathematics 121A-121B or 127A-127B
- (b) Mathematics 139A-139B-167 or 151A-151B-151C
- (c) Statistics 130A-130B or Mathematics 131 and Statistics 131B or Statistics 131A-131B

Additional upper division mathematics to total minimum of 45 upper division units (8-13)

Recommended: Mathematics 140, 143, 168; Computer Science Engineering 123; Electrical and Computer Engineering 180.

Track 4: General Mathematics

Mathematics 115A, 141

Choose one course sequence from each of (a), (b), and (c)
- (a) Mathematics 115B or 139A-139B or 151A-151B
- (b) Mathematics 118A-118B or 121A-121B or 127A-127B
- (c) Mathematics 140 or 143

Additional upper division mathematics to total minimum of 45 upper division units (17-24)

Recommended: Mathematics 126, 185A, 185B; additional units in computer science.

Total Units for the Major 73-93

Recommended Language Preparation

Bachelor of Science degree candidates are advised, but not required, to satisfy the same language requirement as that for a Bachelor of Arts degree candidate, and to fulfill it in French, German, or Russian.

Depth Subject Matter Requirements

Certain mathematically oriented courses given by other departments may be admissible in partial satisfaction of the above mentioned 36- or 45-unit requirements with prior departmental approval. In general, 190C, 192, 197TC, 198, and 199 courses are not appropriate for application towards *this requirement*; and any exceptions must be approved by the Department's Undergraduate Curriculum Committee.

Statement of Objectives. As early as possible, but no later than the last quarter of the sophomore year, each prospective mathematics major should choose, in consultation with an adviser, one of the tracks as suggested by the adviser, prepare a statement of his or her mathematics objectives, and have a proposed program satisfying the requirements of the chosen track. The form to be used for this statement is available from the Department, and must be submitted in time to receive final approval prior to the last day of instruction of the first quarter of the junior year. Prospective mathematics majors transferring to the University at the upper division level should consult an adviser immediately upon arrival.

Major Advisers. H. L. Alder, D. O. Banks, R. J. Buck, G. D. Chakerian, D. O. Cutler, A. L. Edelson, R. D. Glauz, A. M. Hastings, M. R. Krom, G. J. Kurowski, M. S. Mangel, D. G. Mead, E. O. Milton, R. E. Plant.

Special Area Advisers. F. A. Howes, (Applied Analysis), R. E. Plant (Biological Science), H. J. Weiner (Probability), K. Kreith (Social Science, Minor Program), A. J. Krener (Systems Theory).

Information for Undergraduates. Students interested in the study of mathematics should obtain the Undergraduate Brochure, which is available at the Department Office. Assistance in planning an undergraduate major program in mathematics should be obtained from a major adviser. In addition, students seeking information pertaining to the application of mathematics to the biological or social sciences or computer science may contact the appropriate special area adviser.

Students desiring preparation towards an A.B. degree for secondary teaching or general mathematics, or a B.S. degree for graduate study, biological sciences, physical sciences, secondary teaching, or general mathematics should consult an undergraduate adviser.

Prerequisite Credit. No student may repeat a course, if that course is a prerequisite for a course which has already been completed with a grade of C– or better.

Minor Program Requirements:

	UNITS
Mathematics	**20**
Upper division units in mathematics (exclusive of Mathematics 192, 197TC, 198, 199)	20

Three of these units could be from Mathematics 36.

Teaching Credential Subject Representative. G. T. Sallee. See page 98 for the Teacher Education Program.

Graduate Study. The Department offers programs of study and research leading to the M.A., M.A.T., and Ph.D. degrees in mathematics. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Mathematics.

Graduate Advisers. D. O. Cutler, M.S. Mangel, R.E. Plant; K. Kreith (M.A.T. degree).

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. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of $45.)

C. Trigonometry (no credit) I, II. The Staff1
Lecture—2 hours. Basic concepts of trigonometry, including trigonometric functions, identities, inverse functions, and applications. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of $30.)

D. Intermediate Algebra (no credit) I, II. The Staff
Lecture—3 hours. Basic concepts of algebra, designed to prepare the student for college work in mathematics, such as course 16A, or 21A. Functions, equations, graphs, logarithms, and systems of equation. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of $15.)

10. Mathematics and Civilization (4) II. Kreith
Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra and geometry. Historical account of role of mathematics in western civilization. Discussion of contemporary attempts to extend realm of mathematics beyond its established role as language of physical sciences and into human affairs. Course will include problem solving in areas covered.

11. Analytic Geometry (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: two years high school algebra, plane geometry, plane trigonometry; and obtaining required score on Mathematics Diagnostic Examination. Analytic geometry in two dimensions; elementary functions.

(Note: Mathematics 16A, 16B, and 16C are intended for students who will take no more Mathematics courses.)

16A. Short Calculus (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: one and one-half years of high school algebra, plane geometry, plane trigonometry, and obtaining required score on Mathematics Diagnostic Examination. Limits; differentiation of algebra functions; analytic geometry; applications, in particular to maxima and minima problems. Not open to students who have received credit for course 21A.

16B. Short Calculus (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 16A or 21A. Integration; calculus for trigonometric, exponential and logarithmic functions; applications. Not open to students who have received credit for course 21B.

16C. Short Calculus (3) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 16B or 21B. Differential equations; partial derivatives; double integrals; applications; series. Not open to students who have received credit for course 21C.

21A. Calculus (4) I, II, III. The Staff
Lecture-discussion—4 hours. Prerequisite: two years of high school algebra, plane geometry, plane trigonometry, and analytic geometry or course 11, and obtaining required score on Mathematics Diagnostic Examination. Functions, limits, continuity. Slope and derivative. Differentiation of algebraic and transcendental functions. Applications to motion, natural growth, graphing, extrema of a function. Differentials. L'Hôpital's rule. Only two units of credit will be allowed to students who have credit for course 16A.

21AH. Honors Calculus (4) I. The Staff
Lecture—4 hours. More intensive treatment of material covered in course 21A. Students completing 21AH can continue with course 21BH or the regular 21B.

21B. Calculus (4) I, II, III. The Staff
Lecture-discussion—4 hours. Prerequisite: course 21A or 21AH. Continuation of course 21A. Definition of definite integral, fundamental theorem of calculus, techniques of integration. Application to area, volume, arc length, average of a function, improper integrals, surface of revolution. Only two units of credit will be allowed students who have received credit for course 16B.

21BH. Honors Calculus (4) II. The Staff
Lecture—4 hours. More intensive treatment of material covered in course 21B. Students completing 21BH can continue with course 21CH or the regular 21C.

21C. Calculus (4) I, II, III. The Staff
Lecture-discussion—4 hours. Prerequisite: course 21B or 21BH. Continuation of course 21B. Sequences, series, tests for convergence, Taylor expansions. Partial derivatives, total differentials. Applications to maximum and minimum problems in two or more variables. Definite integrals over plane and solid regions in various coordinate systems. Applications to physical systems.

21CH. Honors Calculus (4) III. The Staff
Lecture-discussion—4 hours. More intensive treatment of material covered in course 21C.

22A. Linear Algebra (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: nine units of college mathematics. Matrices and linear transformations, determinants, complex numbers, quadratic forms. (Courses 22A, 22B, 22C may be taken in any order. However, if enrolled in Physics 8 sequence, 8B-8C-8D, courses should be taken in reverse order, 22C, 22B, 22A.)

***22AH. Honors Linear Algebra** (3) III. The Staff
Lecture—3 hours. Prerequisite: course 22BH or consent of instructor. More intensive treatment of material covered in course 22A.

NOTE: For key to footnote symbols, see page 123.

22B. Differential Equations (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 21C. Solutions of elementary differential equations.

***22BH. Honors Differential Equations** (3) II. The Staff
Lecture—3 hours. Prerequisite: course 22CH or consent of instructor. More intensive treatment of material covered in course 22B.

22C. Vector Analysis (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 21C. Vector algebra, vector calculus. Scalar and vector fields. Line and surface integrals. Green's theorem, Stokes' theorem, divergence theorem.

***22CH. Honors Vector Analysis** (3) I. The Staff
Lecture—3 hours. Prerequisite: course 21C or consent of instructor. More intensive treatment of material covered in course 22C.

36. Fundamentals of Mathematics (3) 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. Not open to those who have received credit for course 108.

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

Upper Division Courses

108. 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.

***114. The Theory of Convex Sets** (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 21C, 22A, 108; or consent of instructor. Topics selected from the theory of convex bodies, convex functions, geometric inequalities, combinatorial geometry, and integral geometry. Offered in even-numbered years.

115A. The Theory of Numbers (3) I, Alder
Lecture—3 hours. Prerequisite: course 108. Divisibility and related topics, diophantine equations, selected topics from the theory of prime numbers.

***115B. The Theory of Numbers** (3) II. Alder
Lecture—3 hours. Prerequisite: course 108. Euler function, Moebius function, congruences, primitive roots, quadratic reciprocity law. Offered in even-numbered years.

***115C. The Theory of Numbers** (3) III. Alder
Lecture—3 hours. Prerequisite: course 108. Continued fractions, partitions. Offered in even-numbered years.

116. Metric Differential Geometry (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22C; or consent of instructor. Vector analysis, curves and surfaces in three dimensions. Offered in odd-numbered years.

118A. Partial Differential Equations: Elementary Methods of Solution (3) II. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C. Partial differential equations of mathematical physics, solution by separation of variables. Fourier series.

118B. Partial Differential Equations: Boundary Value Problems and Special Functions (3) III. The Staff
Lecture—3 hours. Prerequisite: course 118A. Classical boundary value problems, expansion by orthogonal functions, Sturm-Liouville theory, special functions.

119. Theory of Ordinary Differential Equations (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B. 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.

121A-121B. Advanced Calculus for the Sciences (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C. Multidimensional calculus, Fourier series, calculus of variations, special functions, distributions, integral transforms, estimation and inequalities. Intended primarily for students majoring in science, engineering, and applied mathematics.

***125. Introduction to Mathematical Logic** (3) I. Krom
Lecture—3 hours. Prerequisite: course 108. Propositional calculus, predicate calculus, normal forms, completeness. Offered in odd-numbered years.

126. Introduction to the Theory of Sets (3) II. The Staff
Lecture—3 hours. Prerequisite: course 108 or consent of instructor. Fundamental concepts including cardinal numbers, order types, ordinal numbers. Offered in odd-numbered years.

127A-127B-127C. Advanced Calculus (4-4-4) I-II-III. The Staff
Lecture—3 hours; extensive reading and problem solving. Prerequisite: courses 22A, 22C; course 108 (may be taken concurrently with consent of instructor). Real number system, continuity, differentiation and integration on the real line; vector calculus and functions of several variables; theory of convergence.

128A. Numerical Analysis (4) I. The Staff
Lecture—3 hours; term project. Prerequisite: course 21C; knowledge of a programming language such as PASCAL, FORTRAN or BASIC. Error analysis, approximation, interpolation, numerical differentiation and integration.

128B. Numerical Analysis in Solution of Equations (4) II. The Staff
Lecture—3 hours; term project. Prerequisite: course 21C and 22A; knowledge of a programming language such as PASCAL, FORTRAN or BASIC. Solution of nonlinear equations and nonlinear systems. Minimization of functions of several variables. Simultaneous linear equations. Eigenvalue problems.

128C. Numerical Analysis in Differential Equations (4) III. The Staff
Lecture—3 hours; term project. Prerequisite: courses 22A, 22B, and 128A; knowledge of a programming language such as PASCAL, FORTRAN or BASIC. Difference equations, operators, numerical solution of ordinary and partial differential equations.

131. Methods of Mathematical Probability (4) I. The Staff
Lecture—4 hours. Prerequisite: courses 21C and 22A. Probability space, event, combinatorics; discrete, continuous distributions; random variables; joint, marginal conditional densities; transformation; expectation; sums and moments; inequalities; laws of large numbers; central limit law; probability models via conditioning; tables. Students who have had Statistics 131A may not receive credit for this course.

132A-*132B. Introduction to Stochastic Processes (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: course 131 (or Statistics 131A). Random walks, recurrent events, Markov chains, birth-and-death processes.

133. Probabilistic Models in Operations Research (3) III. The Staff
Lecture—3 hours. Prerequisite: course 132A. Applications of probability to the study of biological and social systems. Topics include the Poisson process, reliability, queueing, inventory models, Markov chains and processes, diffusion processes. Offered in odd-numbered years.

139A. Introduction to Algebra (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 22A and 108 or consent of instructor. Introduction to the theory and applications of groups, rings, and fields. Not open to students who have received credit or are currently enrolled in course 151A without consent of Department Chairperson.

139B. Introduction to Algebra (3) II. The Staff
Lecture—3 hours. Prerequisite: course 139A. Continuation of course 139A.

140. Simulation and Modelling (3) II, III. The Staff
Lecture—3 hours. Prerequisite: courses 22A and 22B; knowledge of a programming language such as PASCAL, FORTRAN or BASIC. Introduction to modelling and computer simulation. Models in biology, economics, social sciences. Use of differential equations and game theory.

141. Euclidean Geometry (3) II. The Staff
Lecture—3 hours. Prerequisite: course 108. An axiomatic and analytic examination of Euclidean geometry from an advanced point of view. In particular, a discussion of its relation to other geometries.

143. Biomathematics (3) II. Plant
Lecture—3 hours. Prerequisite: courses 22A, 22B. Applications of mathematical techniques in biology and the life sciences. Topics vary with instructor; may include compartmental analysis, enzyme kinetics, population models, blood flow and neural modelling.

***147. Topology** (3) II. Borges
Lecture—3 hours. Prerequisite: course 108. Basic notions of point-set and combinatorial topology. Offered in even-numbered years.

151A-151B-151C. Algebra (4-4-4) I-II-III. The Staff
Lecture—3 hours; extensive reading and problem solving. Prerequisite: course 108. Groups, rings, fields and linear transformations. Course emphasizes theory and is recommended for those planning graduate level mathematics.

167. Linear Algebra and Applications (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 22A. Introduction to linear algebra: linear equations, orthogonal projections, similarity transformations, quadratic forms, eigenvalues and eigenvectors. Applications to physics, engineering, economics, biology and statistics.

168. Mathematical Programming (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 21C, and 22A or 167; knowledge of a programming language. Linear programming, simplex method. Basic properties of unconstrained nonlinear problems, descent methods, conjugate direction method. Constrained minimization.

185A. Functions of a Complex Variable with Applications (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 22C. Complex number systems, analyticity and the Cauchy-Riemann equations, elementary functions, complex integration, power and Laurent series expansions, residue theory.

185B. Functions of a Complex Variable with Applications (3) I. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 185A or consent of instructor. Analytic functions, elementary functions and their mapping properties, applications of Cauchy's integral theorem, conformal mapping and applications to heat flow and fluid mechanics. Offered in even-numbered years.

192. Internship in Applied Mathematics (1-3) I, II, III. The Staff (Chairperson in charge)
Work-learn experience; final report. Prerequisite: upper division standing; project approval by faculty sponsor prior to enrollment. Supervised work-learn experience in applied mathematics. May be repeated for credit for a total of 10 units. (P/NP grading only.)

197TC. Tutoring Mathematics in the Community (1-5) I, II, III. The Staff (Chairperson in charge)
Seminar—1-2 hours; laboratory—2-6 hours. Prerequisite: upper division standing and consent of instructor. Special projects in mathematical education which involve the development of techniques for mathematics instruction and tutoring on an individual or small group basis. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201A-201B-201C. Real Analysis (4-4-4) I-II-III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour or paper (instructor's option). Prerequisite: course 127C. Point-set topology; Lebesgue measure and integration on the real line; abstract spaces; general measure and integration.

202A-202B-202C. Topics in Analysis and Measure Theory (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 201C. Selected topics in analysis and measure theory. Offered in even-numbered years.

203A-203B-203C. Modern Applied Analysis (3-3-3) I-II-III. The Staff (Chairperson in Charge)
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Linear space theory, normed linear spaces, Hilbert space, duality theory, linear operator theory. Applications to optimization, differential equations, perturbation and scaling.

205A-205B-205C. Functions of a Complex Variable (4-4-4) I-II-III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour or paper (instructor's option). Prerequisite: course 127C. Theory of analytic functions. Cauchy integral theorem, power series, analytic continuation, conformal mapping, special functions. Offered in even-numbered years.

210A. Topics in Geometry (3) I. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced geometry related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210AL. Topics in Geometry: Discussion (1) I. The Staff (Chairperson in charge)
Lecture-discussion—1 hour (to be arranged). Prerequisite: course 210A (concurrently); consent of instructor. Special topics related to course 210A which are of special interest to teachers and candidates for M.A.T. degree program. May be repeated for credit.

210B. Topics in Algebra (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced algebra related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210BL. Topics in Algebra: Discussion (1) II. The Staff (Chairperson in charge)
Lecture-discussion—1 hour (to be arranged). Prerequisite: course 210B (concurrently); consent of instructor. Special topics related to course 210B which are of special interest

NOTE: For key to footnote symbols, see page 123.

to teachers and candidates for M.A.T. degree program. May be repeated for credit.

210C. Topics in Analysis (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced analysis related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210CL. Topics in Analysis: Discussion (1) III. The Staff (Chairperson in charge)
Lecture-discussion—1 hour (to be arranged). Prerequisite: course 210C (concurrently); consent of instructor. Special topics related to course 210C which are of special interest to teachers and candidates for M.A.T. degree program. May be repeated for credit.

***213A-213B. Stochastic Differential Equations and Applications** (3-3) II-III. Mangel
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Review of probability and simple stochastic processes. Linear stochastic differential equations, methods for solution. Properties of Gauss-Markov processes, applications. Non-linear stochastic differential equations, Ito and Stratonovich calculi, diffusion processes, numerical methods. Theory of boundary conditions. Asymptotic methods for the solution of stochastic differential equations. Filtering, applications. Offered in even-numbered years.

215A-215B-215C. Topology (4-4-4) I-II-III. Borges
Lecture—3 hours; discussion—1 hour or paper (instructor's option). Prerequisite: graduate standing in mathematics or consent of instructor. Topics selected from point-set topology, homotomy theory, and homology theory. Offered in even-numbered years.

218A-218B. Partial Differential Equations (3-3) I-II. Benson
Lecture—3 hours. Prerequisite: courses 22A, 127C. Topics from the theory of partial differential equations and integral equations. Offered in even-numbered years.

***219A-219B. Ordinary Differential Equations** (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 127C. Ordinary differential equations in the real and complex domains; existence and uniqueness theorems; linear sys tems; analysis of singular points; Sturm-Liouville theory; asymptotic expansions. Offered in odd-numbered years.

220A-220B-220C. Mathematics for the Physical Sciences (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 118B, and 185A or the equivalent. Topics in ordinary and partial differential equations, boundary value problems, functions of a complex variable, matrices and calculus of variations.

***221A-221B. Mathematical Fluid Dynamics** (3) I-II. Howes
Lecture—3 hours. Prerequisite: course 118B. Dynamics of fluid motion, perfect fluids, rotational and irrotational motion, two-dimensional and three-dimensional axisymmetric flows, compressible and incompressible viscous fluids. Offered in odd-numbered years.

***223. Asymptotic Analysis** (3) III. Howes
Lecture—3 hours. Prerequisite: consent of instructor. Basic asymptotic analysis; regular and singular perturbations; asymptotic evaluation of integrals and differential equations. (Offered in even-numbered years.)

***225A-225B. Metamathematics** (3-3) II-III. Krom
Lecture—3 hours. Prerequisite: course 126 or the equivalent. Axiomatizability, consistency, and completeness of the formalized mathematical theories; definability in formal languages; topics from the theory of models. Offered in even-numbered years.

228A-228B-228C. Numerical Solution of Differential Equations (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 128C. Numerical solutions of initial-value, eigenvalue and boundary-value problems for ordinary differential equations. Numerical solution of parabolic and hyperbolic partial differential equations. Offered in even-numbered years.

***229A-229B. Numerical Methods in Linear Algebra** (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Computational methods for the solution of linear algebraic equations and matrix eigenvalue problems. Analysis of direct and iterative methods. Special methods for sparse matrices. Offered in odd-numbered years.

***230. Numerical Methods for Nonlinear Equations and Optimization** (3) III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Numerical methods for the solution of nonlinear algebraic equations. Constrained and unconstrained optimization. Offered in even-numbered years.

234. Mathematics of Renewable Resources (3) II. Mangel
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Applications of mathematics and operations research in agricultural and resource management.

235A-235B-235C. Probability Theory (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 127C. Measure-theoretic foundations of probability, distribution functions and characteristic functions, law of large numbers and central limit theorems, conditional probabilities, martingales.

***240A-240B-240C. Differential Geometry** (3-3-3) I-II-III. Chakerian
Lecture—3 hours. Prerequisite: course 116 or consent of instructor. Introduction to differentiable manifolds, the tangent bundle, tensor fields, differential forms. DeRham cohomology, connections, Lie groups, Riemannian geometry. Offered in odd-numbered years.

***250A-250B-250C. Algebra** (4-4-4) I-II-III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour or paper (instructor's option). Prerequisite: graduate standing in Mathematics or consent of instructor. Theory of groups, rings, and fields. Offered in odd-numbered years.

251A-251B-251C. Advanced Study in Algebra (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 250 or consent of instructor. Advanced study of groups, semigroups, algebraic groups, abelian groups, rings, modules, fields, homological algebra, differential algebra, and others. Offered in even-numbered years.

270A-270B. Modern Methods of Operations Research (3) II-III. Mangel
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Modelling, scaling, nondimensionalization. Deterministic control theory, nonlinear deterministic differential equations, nonlinear filtering, nonlinear optimization. Decision theory, information theory and applications. Stochastic differential equations, differential games. Offered in odd-numbered years.

280. Topics in Pure and Applied Mathematics (1-3) I, II, III. The Staff
Lecture—1-3 hours. Prerequisite: graduate standing. Special topics in various fields of pure and applied mathematics. Topics selected based on the mutual interests of students and faculty.

290. Seminar (1-6) I, II, III. The Staff (Chairperson in charge)
Advanced study in various fields of mathematics, including the following: algebraic theory of semigroups, control theory, mathematical logic, mathematical statistics, ordinary differential equations, partial differential equations, theory of distributions, and univalent functions. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

300A. The Teaching of Mathematics, K-9 (1-1-1) I-II-III. 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. 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, pending completion of course.)

***300B. The Teaching of Mathematics** (3) I, II, III. The Staff
Lecture, discussion, laboratory and field work—2-6 hours. Prerequisite: consent of instructor or senior or graduate standing; simultaneous teaching experience, and a mathematics minor or the equivalent. Mathematics curriculum and teaching methods. Students may complete the course in 1, 2, or 3 quarters. Students teaching full time who wish to complete 3 units during a single year must enroll during the Fall Quarter. (Deferred grading only, pending completion of course.)

***301A-301B-301C. Mathematics Teaching Practicum** (3-3-3) I-II-III. The Staff (Chairperson in charge)
Laboratory—6 hours. Prerequisite: concurrent enrollment in course sequences 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.

***302A-302B-302C. Curriculum Development in Mathematics** (1-1-1) I-II-III. The Staff (Chairperson in charge)
Lecture—1 hour. Prerequisite: concurrent enrollment in course sequence 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 (Chairperson in charge)
Lecture—1 hour. Prerequisite: concurrent enrollment in course sequence 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.

390. Methods of Teaching Mathematics (3) I. The Staff
Lecture—1 hour; discussion—1 hour; laboratory—2 hours. Prerequisite: graduate standing. Practical experience in methods and problems of the teaching of mathematics at University level. Includes discussion of lecturing techniques, analysis of tests and supporting material, preparation and grading of examinations, and related topics. Required of departmental teaching assistants. May be re peated for credit. (S/U grading only.)

Medical Microbiology

See Medicine

Medicine

School of, this page; Medicine (Veterinary Medicine), see page 268

Medicine

(School of Medicine)

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Marlene Mirassou, M.D., Assistant Dean
Francis Pepitone-Arreola-Rockwell, Ph.D., Assistant Dean
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Dean's Office, Medical Sciences IC (752-0331)

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NOTE: For key to footnote symbols, see page 123.

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Eli Benjamini, Ph.D., Professor *(Medical Microbiology and Immunology)*
[1]Daniel R. Benson, M.D., Associate Professor *(Orthopaedic Surgery)*
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David L. Estep, M.D., Instructor in Residence *(Anesthesiology)*
Diane O. Etchison, Ph.D., Assistant Adjunct Professor *(Biological Chemistry)*
James R. Etchison, Ph.D., Assistant Adjunct Professor *(Internal Medicine, Biological Chemistry)*
Charles J. Fisher, Jr., M.D., Assistant Professor *(Internal Medicine)*
Faith T. Fitzgerald, M.D., Associate Professor *(Internal Medicine)*
Mark P. Fletcher, M.D., Assistant Professor in Residence *(Internal Medicine)*
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Dennis Fung, Associate Clinical Professor *(Anesthesiology)*
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Maria E. Garcia, R.N., Adjunct Lecturer *(Family Practice)*
Murray B. Gardner, M.D., Professor *(Pathology)*
Michael C. Geokas, M.D., Ph.D., Professor in Residence *(Internal Medicine, Biological Chemistry)*
M. Eric Gershwin, M.D., Professor *(Internal Medicine)*
[1]Jerry R. Gillespie, Ph.D., Professor *(Human Physiology)*
Robert E. Gillis, Jr., D.M.D., Adjunct Lecturer *(Otorhinolaryngology)*
Shri N. Giri, B.V.Sc., Ph.D., Professor *(Pharmacology)*
Boyd W. Goetzman, M.D., Ph.D., Associate Professor *(Pediatrics)*
Eli Gold, M.D., Professor *(Pediatrics)*
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Joe W. Gray, Ph.D., Assistant Adjunct Professor *(Radiology)*
Sarah D. Gray, Ph.D., Professor *(Human Physiology)*
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Edward C. Hoppin, M.D., Clinical Instructor *(Internal Medicine)*
Thomas W. Hudson, M.D., Assistant Professor *(Family Practice)*

NOTE: For key to footnote symbols, see page 123.

Glenn C. Hunter, M.D., Assistant Professor in Residence *(Surgery)*
Robert L. Hunter, Ph.D., Professor *(Human Anatomy)*
Arthur C. Huntley, M.D., Assistant Professor *(Dermatology)*
Edward J. Hurley, M.D., Professor *(Surgery)*
Daniel Ikeda, M.D., Instructor *(Internal Medicine)*
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Gregory G. Janos, M.D., Assistant Professor in Residence *(Pediatrics)*
Gordon D. Jensen, M.D., Professor *(Psychiatry, Pediatrics)*
Hanne M. Jensen, M.D., Associate Professor in Residence *(Pathology)*
[2]Chris A. Johnson, Ph.D., Associate Professor *(Ophthalmology)*
George W. Jordan, M.D., Professor *(Internal Medicine; Pathology)*
Michael C. Jordan, M.D., Professor in Residence *(Internal Medicine)*
Jenifer Jowsey, Ph.D., Adjunct Professor *(Orthopaedic Surgery)*
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Howard Klein, M.D., Assistant Professor in Residence *(Pathology)*
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Lindy F. Kumagai, M.D., Professor *(Internal Medicine)*
Geoffrey Kurland, M.D., Assistant Professor in Residence *(Pediatrics)*
Bo M. T. Lantz, M.D., Professor *(Radiology)*
Corey Largman, Ph.D., Assistant Adjunct Professor *(Internal Medicine, Biological Chemistry)*
Edward C. Larkin, M.D., Professor in Residence *(Internal Medicine)*
Lawrence J. Laslett, M.D., Assistant Professor in Residence *(Internal Medicine)*
Jerold A. Last, Ph.D., Associate Professor *(Internal Medicine, Biological Chemistry)*
Jack Lazerson, M.D., Professor *(Pediatrics, Pathology)*
James C. Leek, M.D., Assistant Professor *(Internal Medicine)*
Rebecca Leonard, Ph.D., Assistant Adjunct Professor *(Otorhinolaryngology)*
Alvin E. Lewis, M.D., Professor *(Pathology)*
Ernest L. Lewis, M.D., Associate Clinical Professor *(Urology)*
Jerry P. Lewis, M.D., Professor *(Internal Medicine, Pathology)*
Richard A. Lewis, M.D., Assistant Professor in Residence *(Ophthalmology)*
James S. Lieberman, M.D., Professor *(Physical Medicine and Rehabilitation, Neurology)*
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Stanley Meizel, Ph.D., Professor *(Human Anatomy)*
Mortimer L. Mendelsohn, M.D., Ph.D., Adjunct Professor *(Radiology)*
Martin Mendelson, M.D., Ph.D., Assistant Professor *(Family Practice)*
Janet Mentink, F.N.P., Lecturer *(Family Practice)*
Katharine M. Merritt, Ph.D., Associate Professor in Residence *(Orthopaedic Surgery)*
Frederick J. Meyers, M.D., Assistant Professor in Residence *(Internal Medicine)*
Claramae H. Miller, Ph.D., Assistant Clinical Professor *(Pathology, Internal Medicine)*
Michael E. Miller, M.D., Professor *(Pediatrics, Pathology)*
Stanley L. Mills, Ph.D., Assistant Professor in Residence *(Radiology)*
Jay M. Milstein, M.D., Assistant Professor in Residence *(Pediatrics)*
Paul A. Molé, Ph.D., Associate Professor *(Physical Medicine and Rehabilitation)*
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Michael R. Myracle, M.D., Assistant Professor in Residence *(Radiology)*
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Nirmala N. Nayak, M.D., Assistant Professor *(Physical Medicine and Rehabilitation)*
Kenneth R. Niswander, M.D., Professor *(Obstetrics and Gynecology)*
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George A. Palma, M.D., Assistant Clinical Professor *(Neurology)*
Julio C. Palmaz, M.D., Assistant Professor in Residence *(Radiology)*
John M. Palmer, M.D., Professor *(Urology)*
Philip E. S. Palmer, M.D., F.R.C.P., Professor *(Radiology)*
Demosthenes Pappagianis, M.D., Ph.D., Professor *(Medical Microbiology and Immunology)*
Raymond Parks, M.D., Clinical Professor *(Radiology)*
Gibbe H. Parsons, M.D., Associate Professor *(Internal Medicine)*
Hugh Patterson, Ph.D., Adjunct Lecturer *(Human Anatomy)*
Francis Pepitone-Arreola-Rockwell, Ph.D., Associate Professor *(Psychiatry)*
Neville R. Pimstone, M.D., Professor *(Internal Medicine)*
Valentin Popa, M.D., Associate Professor in Residence *(Internal Medicine)*
Bruce A. Porter, M.D., Assistant Professor in Residence *(Radiology)*
Manuel Porto, M.D., Assistant Professor *(Obstetrics and Gynecology*
Margaret M. Portwood, M.D., Assistant Professor *(Physical Medicine and Rehabilitation)*
George T. Rab, M.D., Associate Professor *(Orthopaedic Surgery)*
Kathryn Radke, Ph.D., Assistant Adjunct Professor *(Biological Chemistry)*
Lawrence Rabinowitz, Ph.D., Professor *(Human Physiology)*
Antolin Raventos, M.D., Professor in Residence *(Radiology)*
Stanley B. Reich, M.D., Professor in Residence *(Radiology)*
Michael H. Reid, M.D., Ph.D., Associate Professor *(Radiology)*
Michael Reinhart, M.D., Assistant Professor *(Pediatrics)*
John A. Reitan, M.D., Associate Professor *(Anesthesiology)*
Helmut Relinger, Ph.D., Assistant Professor in Residence *(Psychiatry)*
Michael P. Remler, M.D., Associate Professor in Residence *(Neurology)*
Eugene M. Renkin, Ph.D., Professor *(Human Physiology)*
Dick L. Robbins, M.D., Associate Professor *(Internal Medicine)*
John A. Robbins, M.D., Assistant Professor *(Internal Medicine)*
Don A. Rockwell, M.D., Professor *(Psychiatry)*
Carl J. Rosenquist, M.D., Professor *(Radiology)*
Alan M. Roth, M.D., Professor *(Ophthalmology, Pathology)*
Robert B. Rucker, Ph.D., Professor *(Biological Chemistry)*
Boris Ruebner, M.D., Professor *(Pathology)*
Lisa Russell, M.D., Assistant Professor *(Pathology)*
John Rutledge, M.D., Instructor *(Internal Medicine)*
Amira Safwat, M.B.B.C.A., Assistant Clinical Professor *(Anesthesiology)*
Kathleen D. Sanders, M.D., Assistant Professor in Residence *(Pediatrics)*
Ethelda N. Sassenrath, Ph.D., Associate Professor in Residence *(Psychiatry)*
Andrew W. Saxe, M.D., Assistant Professor *(Surgery)*
Charles Schaffer, M.D., Assistant Professor *(Psychiatry)*
Marc B. Schenker, M.D., Assistant Professor *(Internal Medicine)*
Alan B. Schwartz, M.D., Assistant Professor in Residence *(Internal Medicine)*
Marshall Z. Schwartz, M.D., Associate Professor *(Surgery)*
Robert J. Scibienski, Ph.D., Associate Professor *(Medical Microbiology and Immunology)*

NOTE: For key to footnote symbols, see page 123.

Robert P. Scobey, Ph.D., Professor *(Human Physiology, Neurology, Ophthalmology)*
James A. Seibert, Ph.D., Assistant Professor in Residence *(Radiology)*
Masud Seyal, M.B.B.S., Assistant Professor *(Neurology)*
Bagher Sheikholislam, M.D., Associate Clinical Professor *(Perdiatrics)*
Marc B. Shenker, M.D., Assistant Professor *(Occupational Health)*
Allan D. Siefkin, M.D., Assistant Professor in Residence *(Internal Medicine)*
Karen A. Sigvardt, Ph.D., Assistant Adjunct Professor *(Neurology)*
Joseph Silva, M.D., Professor *(Internal Medicine)*
J. Dale Smith, M.D., Visiting Assistant Professor *(Urology)*
Robert El. Smith, Ph.D., Associate Professor *(Human Physiology)*
Elizabeth M. Smithwick, M.D., Professor *(Pediatrics)*
Robert C. Stadalnik, M.D., Professor *(Radiology)*
Larry G. Stark, Ph.D., Professor *(Pharmacology)*
Krzysztof Stengert, M.D., Professor *(Anesthesiology)*
Margaret S. Steward, Ph.D., Professor *(Psychiatry)*
Richard C. Stillman, M.D., Associate Professor in Residence *(Psychiatry)*
James N. St. John, M.D., Assistant Professor in Residence *(Neurological Surgery)*
Robert E. Stowell, M.D., Ph.D., Professor Emeritus *(Pathology)*
Dennis Styne, M.D., Associate Professor *(Pediatrics)*
Robert M. Szabo, M.D., Assistant Professor in Residence *(Orthopaedic Surgery)*
Robert G. Taylor, M.D., Professor *(Physical Medicine and Rehabilitation)*
Frances R. Tennant, M.D., Adjunct Lecturer *(Obstetrics and Gynecology)*
Henry Tesluk, M.D., Clinical Professor *(Pathology)*
Jerold H. Theis, D.V.M., Ph.D., Associate Professor *(Medical Microbiology and Immunology)*
Wilfred E. Toreson, M.D., Ph.D., Professor *(Pathology)*
Robert R. Traut, Ph.D., Professor *(Biological Chemistry)*
John D. Trelford, M.D., Professor *(Obstetrics and Gynecology)*
Frederic A. Troy II, Ph.D., Professor *(Biological Chemistry)*
Walter Trudeau, M.D., Associate Clinical Professor *(Internal Medicine)*
Joe P. Tupin, M.D., Professor *(Psychiatry)*
C. John Tupper, M.D., Professor *(Community Health, Internal Medicine, Family Practice)*
Judith L. Turgeon, Ph.D., Associate Professor *(Human Physiology)*
Patrick L. Twomey, M.D., Associate Professor in Residence *(Surgery)*
Zakauddin Vera, M.D., Associate Professor *(Internal Medicine)*
William L. Verlenden, M.D., Assistant Professor in Residence *(Surgery)*
Vijaya K. Vijayan, M.D., Ph.D., Associate Professor *(Human Anatomy, Neurology)*
Franklin C. Wagner, M.D., Professor *(Neurological Surgery)*
Donal A. Walsh, Ph.D., Professor *(Biological Chemistry)*
John P. Walter, M.D., Ph.D., Assistant Professor in Residence *(Radiology)*
Robert M. Walter, Jr., M.D., Associate Professor *(Internal Medicine)*
Richard E. Ward, M.D., Associate Professor in Residence *(Surgery)*
Dennis W. Waring, Ph.D., Assistant Professor in Residence *(Human Physiology)*
Worden Waring, Ph.D., Professor Emeritus *(Physical Medicine and Rehabilitation, Human Physiology)*
Edward J. Watson-Williams, M.D., Professor *(Internal Medicine)*
Phillip G. Weiler, M.D., Clinical Professor *(Community Health)*
Sefton R. Wellings, M.D., Ph.D., Professor *(Pathology)*
Richard P. Wennberg, M.D., Professor *(Pediatrics)*
Robert J. Wertz, Ph.D., Associate Adjunct Professor *(Neurology)*
Theodore C. West, Ph.D., Professor *(Pharmacology)*
David A. White, M.D., Instructor in Residence *(Anesthesiology)*
Richard H. White, M.D., Assistant Professor *(Internal Medicine)*
Hibbard E. Williams, M.D., Professor *(Internal Medicine)*
Barry W. Wilson, Ph.D., Professor *(Physical Medicine and Rehabilitation)*
Lowell D. Wilson, M.D., Ph.D., Professor *(Internal Medicine, Biological Chemistry)*
Garen Wintemute, M.D., Assistant Professor *(Family Practice)*
Wallace D. Winters, M.D., Ph.D., Professor *(Internal Medicine, Pharmacology, Psychiatry)*
Bruce M. Wolfe, M.D., Associate Professor *(Surgery)*
Earl F. Wolfman, Jr., M.D., Professor *(Surgery)*
David L. Woods, Ph.D., Assistant Adjunct Professor *(Neurology)*
Hiroshi Yamauchi, M.D., Clinical Professor *(Internal Medicine)*
Connie Yim, M.D., Assistant Clinical Professor *(Internal Medicine)*
Julian R. Youmans, M.D., Ph.D., Professor *(Neurological Surgery)*
Gloria Yu, M.D., Assistant Professor in Residence *(Pathology)*
Jean A. Zellé, M.A., Lecturer Emeritus *(Physical Medicine and Rehabilitation)*
Vincent Ziboh, Ph.D., Professor *(Dermatology)*
Elinor Zorn, M.D., Visiting Assistant Professor *(Pediatrics)*

Admission Requirements and Professional Curriculum. Detailed information can be obtained from the School of Medicine. See also page 111.

Courses in the School of Medicine

Curriculum for the School of medicine

The curriculum for the M.D. degree at the University of California, Davis School of Medicine is a four-year program to provide comprehensive training for the practice of medicine. It offers a blend of basic science training and clinical experience with opportunities for research. While the first two years emphasize the basic science basis of medicine, the student is exposed even from the onset to questions of patient management, thus providing a natural transition from the entry pregraduate training into the clinical training of the final two years.

The first-year program is for three quarters, beginning in the Fall. The basic sciences (anatomy, physiology, biochemistry, immunology, general pathology) are blended with social sciences (social and behavioral biology, the life cycle), and students are introduced to the art of communicating with patients, and emergency medicine. The second-year program is for four quarters, but with the Summer Quarter abbreviated to six weeks. The Summer Quarter provides a transition between basic and clinical sciences with the presentation of pathology, an integrated course in nutrition, and a course on human sexuality. In the remaining three quarters, the students complete their training in basic sciences (pharmacology, microbiology) and are then, from an organ system approach, presented the pathophysiological basis of disease (endocrine, hematopoietic/lymphoreticular, gastrointestinal, integumentary, musculoskeletal, neuromuscular, reproductive, respiratory, urinary). During the second year, students continue training in physical diagnosis, are introduced to laboratory diagnostic techniques (laboratory medicine, nuclear medicine), and are presented with issues in community health. The third-year program is comprised of required clerkship rotations in the clinical specialties: twelve weeks of surgery, twelve weeks of medicine, and eight weeks each of maternal health, child health, and psychiatry. In the fourth year of the M.D. degree program, students begin to individualize their medical career by the selection of one of three specialty tracks: (1) surgery, (2) medicine, and (3) family practice and behavioral specialties. Within each of the tracks the student has eight weeks of required clerkships, twenty weeks of selected clerkships and an opportunity of up to twelve weeks of electives. With demonstrated superior clinical skills in the third-year clerkships, students may substitute a year of research accompanied by completion of a thesis for the fourth-year track.

To satisfy the M.D. degree program, the student must successfully complete 255 credits of course work and clerkships. Students who enter the program with advanced training in one of the areas required for the program are permitted to substitute required courses with electives of equal credit. In addition to the fourth-year elective program available, there is some opportunity for selecting electives during the first two years, in particular during the interim period between the first and second years.

First-Year Required Courses

Quarter I: Fall

	UNITS
Biological Chemistry 410A, molecular and cell biology	5
Family Practice 400A, introduction to patient evaluation	1.5
Human Anatomy 400, gross anatomy	7.5
Human anatomy 401, human embryology	2
Internal Medicine 400, introduction to emergency medicine	1.5
Radiology—Diagnostic 400, correlative human radiologic anatomy	1

Quarter II: Winter

Biological Chemistry 410B, molecular and cell biology	4
Human Anatomy 402, human microscopic anatomy	5
Human Physiology 400, human physiology	8
Family Practice 400B, introduction to patient evaluation	1

Quarter III: Spring

Biological Chemistry/Human Physiology 418, mammalian endocrinology and homeostasis	5
Human Anatomy/Human Physiology 403, neuroscience	5
Medical Microbiology 480A, basic and medical immunology	3
Pathology 411, general pathology	3
Psychiatry 400, the life cycle: normal growth and development	3
Psychiatry 401, social and behavioral medicine	2
Family Practice 400C, introduction to patient evaluation	1.5

Second-Year Required Courses

Quarter IV: Summer

Biological Chemistry/Internal Medicine 419, introduction to clinical nutrition	3
Pathology 423, systemic pathology	7.5
Psychiatry 402, human sexuality	1.5

Quarter V: Fall

Dermatology 420, integumentary system	2
Internal Medicine 420A, hematopoietic and lymphoreticular system	4
Internal Medicine 420B, gastrointestinal system	3.5
Medical Microbiology 480B, pathogenic microbiolgy	7
Pharmacology 400A, principles of pharmacology	4
Radiology—Nuclear Medicine 400, introduction to nuclear medicine	0.5

Quarter VI: Winter

Community Health 407, principles of preventive medicine, epidemiology and biometry	2
Internal Medicine 401A, physical diagnosis practicum	2

NOTE: For key to footnote symbols, see page 123.

Internal Medicine 402, occupational medicine 1
Internal Medicine 420C, pathophysiology of respiratory system 4
Internal Medicine 420D, cardiovascular system 4
Obstetrics and Gynecology/Pediatrics 420, reproductive system and perinatology 2
Pharmacology 400B, principles of pharmacology 5
Psychiatry 403, psychopathology 3

Quarter VII: Spring

Community Health 408, preventive medicine, environmental health, and health care delivery 1.5
Internal Medicine 401B, physical diagnosis practicum 1
Internal Medicine 420E/Urology 420, urinary system 3.5
Internal Medicine 420F, endocrine metabolic-regulatory 4.5
Neurology 420, neuromuscular pathophysiology .. 4.5
Orthopaedic Surgery 421, skeletal system 2.5
Pathology 424, laboratory medicine 2

See departmental listings for course descriptions of the above courses.

Third-Year Required Courses Medical Sciences (core courses)

Professional Courses

430. Required Surgical Clerkship (18) I, II, III, IV. Course Committee Chairperson
Clinical experience—full time (12 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Each student takes required (4 weeks) general surgery. Remaining time allotted between 4-week periods in any two of the following disciplines: neurosurgery, orthopedic surgery, urological surgery, ENT and eye surgery, anesthesiology, and general surgery.

431. Required Medicine Clerkship (18) I, II, III, IV. Course Committee Chairperson
Clinical experience—full time (12 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Two 6-week periods, one each at UCD Medical Center and at Martinez VA Hospital. Direct patient care situations under guidance of full-time volunteer faculty member. Nights and weekend on-call. Completion of 24 full write-ups on patients for whom student will take special responsibility.

432A. Required Obstetrics-Gynecology Clerkship (12) I, II, III, IV. Course Committee Chairperson
Clinical experience—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Obstetric/neonatal/gynecologic experience in delivery room, nursery wards, operating room, clinics. One-third of time spent in gynecology, two-thirds of time in perinatology. Obstetrics, neonatology and continuing care of fetus-neonate emphasized in perinatal period. Seminars and conferences throughout period.

432B. Pediatric Clerkship (12) I, II, III, IV. Course Committee Chairperson
Clinical experience—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Two 4-week periods, one in inpatient rotation (UCD Medical Center or Travis AFB) and one in ambulatory experience (UCD Medical Center). Assumption of appropriate patient care responsibilities; participation in conference/rounds; and seminars during ambulatory rotation.

433. Clinical Clerkship in Psychiatry (12) I, II, III, IV. Course Committee Chairperson
Clinical experience—full time (8 weeks). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Students assigned to various mental health clinical settings following intensive orientation program. Focus on treatment of psychiatric problems encountered by physician in practice. Diagnostic, therapeutic, and interpersonal skills emphasized.

Fourth-Year Requirements

Tracks. The fourth year is comprised of clinical experience in one of three specialty tracks: surgical specialties, medical specialties, and family practice and behavioral specialties. Each track includes required clerkships of 4 weeks each in Ear, Nose, and Throat (ENT)/Eye (Otorhinolaryngology 440 and Ophthalmology 440) and Physical Medicine and Rehabilitation (Physical Medicine and Rehabilitation 440); 20 weeks of selectives; and 12 weeks of electives. The table below outlines the track system.

Track I: Surgical Specialties

	WEEKS
ENT/Eye	4
Physical Medicine and Rehabilitation	4
Selectives	20
Internal Medicine or Pediatrics or Neuroscience courses (8)	
Surgical sciences (12)	
Electives	12

Track II: Medical Specialties

ENT/Eye	4
Physical Medicine and Rehabilitation course	4
Selectives	20
Internal Medicine or Pediatrics courses or combination thereof (12)	
Neurosciences (4)	
Emergency medicine (4)	
Electives	12

Track III: Family Practice and Behavioral Specialties

ENT/Eye	4
Physical Medicine and Rehabilitation course	4
Selectives	20
Internal Medicine or Pediatrics courses or combination thereof (12)	
Neurosciences (8)	
Electives	12

Students with strong research and academic interests who have demonstrated superior clinical performance may elect to meet the fourth-year requirements by special arrangement in consultation with the Associate Dean of Students, the project adviser, and approval of Promotions Board-B. A publishable written communication or thesis is required.

Surgery Clerkships. All fourth-year students, in Tracks I, II, and III are required to take a minimum of four weeks of clerkship in surgery. The required surgery clerkship must be for two weeks each in Ophthalmology 440 and Otorhinolaryngology 440 if these subspecialties have not been taken during the third-year surgery clerkship. If only one of these has been taken during the third year, the other must be taken for either two or four weeks. If both have been taken, then a student is required to take a four-week clerkship in one of the other surgery clerkships listed below.

The following clerkships meet the criteria for the fourth-year required surgery rotation:

- Anesthesiology 460, anesthesiology clinical clerkship
- Neurosurgery 460, clinical neurosurgery; 461, scientific basis for the surgical treatment of neurological disease
- Ophthalmology 440, clinical/surgical orthopaedics
- Otorhinolaryngology 460, clinical otorhinolaryngology elective
- Plastic Surgery 460, clinical plastic surgery elective
- Surgery 462, surgery trauma service clerkship; 464, general surgery clerkship: Kaiser Hospital; 465, general surgery clerkship: Martinez VA Hospital; 466, general surgery clerkship: Travis AF Base Hosptial; 467, surgical oncology; 460, clinical surgical elective: pediatrics
- Urology 460, urology clinical clerkship; 461, externship in urology

See departmental listings which follow this section for descriptions of the above courses.

Other Medical Sciences Courses

Professional Courses

450. Introduction to UCD Medical Center (1) III. Rockwell
Seminar—20 hours total. Prerequisite: second-year medical student. Designed to assist medical student in transition from classroom to hospital setting. (S/U grading only.)

489. Remedial Studies (9) IV. O'Grady
Prerequisite: medical student. Intended for students who failed the Spring National Board Examination. Independent studies to review material from first and second years of curriculum in preparation for taking National Boards in the Fall. Students spend 8-12 hours per day in preparation for these examinations. Faculty consultation and tutoring on individual basis. (S/U grading only.)

Departmental Courses:

Anesthesiology

Upper Division Course

192. Internship in Anesthesiology (1-6) I, II, III, IV. The Staff (Reitan in charge)
Work-learn experience—3 to 18 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-learn experience in anesthesia and related fields. (P/NP grading only.)

Professional Courses

420. Case Management Conference (1) I, II, III, IV. The Staff (Eisele in charge)
Discussion—1 hour. Prerequisite: interns and residents; advanced medical and veterinary students; consent of instructor. Informal discussion of current hospital case material presented by house officers, students and faculty. Clinical and research experience, combined with pertinent literature references, is brought to bear on the problems with emphasis on preventative as well as corrective measures.

421. Basic Science Conference (1) I, II, III, IV. The Staff (Davis in charge)
Discussion—1½ hours. Prerequisite: advanced medical, veterinary, and graduate† students; consent of instructor. Discussion of basic science material related directly to anesthesiology, particularly in the areas of physiology and pharmacology. Selected reading assignments are given in advance and utilized by the instructor to encourage discussion. In selected instances, the topics are organized and presented by the students and residents.

460. Anesthesiology Clinical Clerkship (3-18) I, II, III, IV. Fung and staff
Full-time clinical activity (3 full days per unit). Prerequisite: third- and fourth-year medical students. Provides experience in total anesthetic management including application of physiologic and pharmacologic principles to preoperative, operative and postoperative management of patients. Considers choice and management of general and regional anesthesia techniques, resuscitation, artificial ventilation, inhalation and fluid-electrolyte therapy and pain problems. Students electing portions of the course for credit, must receive consent of instructor. Limited enrollment.

461. Anesthesia Surgical Team Participation: Martinez VA Medical Center (6-9) I, II, III, IV. Gray, Guernsey
Clinical clerkship—full time (4 to 6 weeks). Prerequisite: third- or fourth-year medical student; completion of Medical Sciences 430. Instruction in: (1) pre- and post-anesthesia care, (2) induction and maintenance of anesthesia, (3) hazards and complications of anesthesia, (4) monitoring (including invasive), (5) record keeping, (6) surgery requirements of anesthesia. All training is under staff direction.

490. Resident Seminar (1) I, II, III, IV. The Staff (Eisele in charge)
Lecture—1 hour. Prerequisite: degree in medicine or veterinary medicine or consent of instructor. A series of lectures covering a spectrum of anesthesia and related topics in depth, primarily clinically oriented but also including relevant research material. Presented by faculty, residents, and visiting professors. Pertinent reference lists are circulated in advance of seminars.

498. Individual or Group Study (1-5) I, II, III, IV. Eisele and staff
Discussion—1-5 hours; laboratory—2-10 hours. Prerequisite: interns and residents with consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics.

499. Anesthesiology Research (4-18) I, II, III, IV. Eisele and staff
Laboratory—12-54 hours. Prerequisite: third- or fourth-year medical students, advanced standing undergraduate and veterinary medicine students; or consent of instructor. Problems in clinical and/or laboratory research. (S/U grading only for medical students.)

Behavioral Biology

Lower Division Courses

98. Directed Group Study (1-3) I, II, III, IV. The Staff (Chapman in charge)
Discussion—1-5 hours. Prerequisite: consent of instructor. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

99. Special Study for Undergraduates (1-3) I, II, III, IV. The Staff (Chapman in charge)
Prerequisite: consent of instructor. Laboratory research on selected topics relating to the biological bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problem. (P/NP grading only.)

Upper Division Courses

198. Directed Group Study (1-3) I, II, III, IV. The Staff (Chapman in charge)
Prerequisite: consent of instructor. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research. (P/NP grading only.)

199. Special Study or Advanced Undergraduates (1-3) I, II, III, IV. The Staff (Chapman in charge)
Prerequisite: consent of instructor. Laboratory research on selected topics relating to biological bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problems. (P/NP grading only.)

Graduate Courses

***245. Psychophysiology of Stress** (3) II.
Lecture—2 hours; discussion—1 hour. Prerequisite: consent of instructor. Neuroendocrine, autonomic and behavioral stress response systems. Determinants of effective coping. Physiological and behavioral effects of chronic psychosocial and/or environmental stress. Stress interaction with CNS control of affect; sexual function and drug abuse.

290. Seminar (2) I, II, III, IV. The Staff (Chapman in charge)
Seminar—2 hours. Prerequisite: consent of instructor; open to graduate students. Group discussion and critique of current topics of importance and relevance to behavioral biology. (Same course as 490.)

298. Group Study (1-5) I, II, III, IV. The Staff (Chapman in charge)
Discussion—1-5 hours. Prerequisite: consent of instructor; open to graduate students. Extended evaluative and critical discussions of selected topics relating to the physiological and biochemical bases of behavior. Primary emphasis within any topic will be on the methodology, theory and concepts of current research.

299. Research (1-12) I, II, III, IV. The Staff (Chapman in charge)
Prerequisite: consent of instructor; open to graduate students. Laboratory research on selected topics relating to the physiological and biochemical bases of behavior. Participation in ongoing research projects or planning, initiation and execution of individual research problems. (S/U grading only.)

Professional Courses

490. Seminar (2) I, II, III, IV. The Staff (Chapman in charge)
Seminar—2 hours. Prerequisite: first-, second-, and fourth-year students with consent of instructor. Group discussion and critique of current topics of importance and relevance to behavioral biology. (Same course as 290.)

498. Group Study (1-4) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: first-, second-, and fourth-year medical students; consent of instructor. Social, economic and cultural aspects of medicine.

499. Independent Research Topics (0-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: first-, second-, and fourth-year medical students; consent of instructor. Individual research projects with members of departmental staff.

Biological Chemistry

Lower Division Course

92. Internship in Biological Chemistry (1-12) I, II, III, IV. The Staff (Bradbury in charge)
Work-learn experience—3-36 hours; final report. Supervised work-study experience in biological chemistry and related fields. (P/NP grading only.)

Upper Division Courses

192. Internship in Biological Chemistry (1-12) I, II, III, IV. The Staff (Bradbury in charge)
Work-learn experience—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to internship by preceptor. Supervised work-study experience in Biological Chemistry and related fields. (P/NP grading only.)

198. Group Study (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor. For undergraduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Bradbury in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

209. Biological Significance of Prostaglandins and Related Lipids (2) II. Ziboh
Lecture—2 hours. Prerequisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B or Physiology 100A-100B or the equivalent. Isolation, quantitative estimations and biochemistry of prostaglandins, thromboxanes, prostacyclin and leukotrienes; biosynthesis from precursor fatty acids, metabolism and pathway inhibitions; nutritional effects on formation; physiological and pathophysiological functions in organ systems; present status and therapeutic promise. Offered in even-numbered years.

214. Contemporary Medical Biochemistry (1) II. The Staff (Matthews in charge)
Lecture—1 hour; discussion. Prerequisite: course in biochemistry or the equivalent. Series of lectures on current topics of bio chemistry related to medicine. Material covered stresses concepts derived from biochemical research which have some potential clinical relevance. No examination. (S/U grading only.)

216. Protein Structure (3) II. Benisek
Lecture—3 hours. Prerequisite: Biochemistry and Biophysics 201A or consent of instructor. Course designed to acquaint students at graduate level with currently applied techniques employed in determination of protein structure and significant results derived from them. Techniques which will be presented include amino acid sequence analysis, three-dimensional structure determination by X-ray diffraction, and nuclear magnetic resonance spectroscopy. Offered in odd-numbered years. (S/U grading only).

218A. Mammalian Endocrinology and Homeostasis (5) III. Walsh, Turgeon
Lecture—5 hours. Prerequisite: Biochemistry 101A, 101B, Physiology 110; consent of instructor. Biochemical, physiological and anatomical properties of mammalian endocrine system. Physiological and biochemical principles that regulate homeostasis especially in organ-organ interrelationships of metabolites and minerals. Reproductive endocrinology. (Same course as 418, Human Physiology 418.)

218B. Readings in Endocrine (1) III. Walsh, Turgeon
Seminar—1 hour. Prerequisite: course 218A (concurrently). Presentation by students of key papers in endocrinology that reflect upon topics presented in course 218A.

291. Topics in Cellular Biochemistry and Physiology (2) II. Traut, Sillman (Animal Physiology)
Seminar—2 hours. Prerequisite: one course in biochemistry; Physiology 100A or Zoology 121A or 121B. General physiology, cell biology and molecular biology of living systems, with emphasis on cell form and function. One topic, representing a timely and important area of research, will serve as the focus throughout the course. May be repeated for credit. (Same course as Physiology 291C.)

298. Group Study (1-5) I, II, III, IV. The Staff (Bradbury 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 (Bradbury in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

410A. Molecular and Cell Biology (5) I, Traut, Matthews
Lecture—50 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Molecular and cellular biology presents a comprehensive treatment of the enzymologic and metabolic bases of mammalian cellular function. Discussion of basic elements of protein structure and enzyme action and major pathways of carbohydrate, amino acid, lipid and energy metabolism. Relations of appropriate disease states of human metabolism are emphasized.

410B. Molecular and Cell Biology (4) II. Troy, Traut
Lecture—40 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Continuation of biochemical and molecular aspects studied in course 410A through levels of macromolecular assemblies up to the cell itself. Examination of contemporary aspects of human and molecular genetics, structure and function of cellular membranes and organelles and the control of proliferation in animal cells.

414. Contemporary Medical Biochemistry (1) II. Matthews
Discussion—1 hour. Prerequisite: course in biochemistry or the equivalent. Series of lectures on current topics of biochemistry related to medicine. Material covered stresses concepts derived from biochemical research which have some potential clinical relevance, and are intended to be of interest to medical students. (S/U grading only.) (Same course as 214.)

418. Mammalian Endocrinology and Homeostasis (5) III. Walsh, Turgeon
Lecture—50 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Biochemical, physiological and anatomical properties of mammalian endocrine system. Physiological and biochemical principles that regulate homeostasis especially in organ-organ interrelationships of metabolites and minerals. Reproductive endocrinology. (Same course as course 218A, Human Physiology 418.)

419. Introduction to Clinical Nutrition (3) IV. Halsted, Rucker
Lecture—30 hours total. Prerequisite: completion of first year of School of Medicine; consent by Committee on Student Evaluation and Promotion. Integrates basic concepts of human nutrition-dietary allowances; energy, protein, vitamin and mineral requirements, and metabolism—with current knowledge of the role of nutrition in diseases—obesity, alcoholism, lipidemias, intestinal disorders, aging. (Quarter IV of Medical School curriculum.) (Same course as Internal Medicine 419.)

498. Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: medical students with consent of instructor. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequistie: medical students with consent of instructor. (S/U grading only.)

Clinical Psychology

Graduate Courses

200. Theory of the Person-Adult (4) I, Abramowitz and staff
Lecture—2 hours; seminar—2 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. Major contemporary personality theories will be examined and compared. Emphasis will be placed on those theories which are most relevant to contemporary intervention techniques.

201. Observational Practicum (1-3) I, II, III, IV. The 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. (S/U grading only.)

202. Theories in Clinical Child Psychology (4) I, Steward
Lecture—4 hours. Prerequisite: consent of instructor. Major theories in clinical child psychology, as related to research and clinical findings in pediatrics, child psychiatry and child development.

203. Psychopathology (4) II. Meadow, Relinger
Seminar—4 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. To review the various forms of psychopathological behavior of adults and examine the major theories concerning their etiology.

204. Theory and Treatment of Schizophrenia (3) I, II, III. Meadow and staff
Seminar—3 hours. Prerequisite: graduate status in Clinical Psychology or consent of instructor. Major theories on the etiology of schizophrenia and the chief methods of therapy.

205. Issues in Clinical Psychology (1-4) I, II, III, IV. The Staff
Lectures—1-4 hours. Prerequisite: graduate status in Clinical Psychology or 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. May be repeated for credit. (S/U grading only.)

206. Introduction to Community Psychology (4) III. The Staff
Lecture—2 hours; discussion—2 hours. Prerequisite: graduate students in Clinical Psychology or consent of instructor. Exploration of the basic literature and relevant research findings regarding community mental health. Focus on basic theoretical issues, methods and results of need assessment and program evaluation, implications for mental health planning with specific emphasis on innovative programs.

207. Theories of Group Consultation (3) I, II, III.
Seminar—3 hours. Prerequisite: course 208 (concurrently); 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 (1-3) I, II, III IV. The Staff (Morrison in charge)
Seminar—3 hours; term paper. Prerequisite: consent of instructor. A practicum involving systematic observations, participation, and consultation in a variety of social systems including self-study groups, psychotherapy groups and educational and mental health organizations. May be repeated for credit. (S/U grading only.)

209. Developmental Theory of Jean Piaget (4) I, II, III. Steward
Seminar—4 hours. Prerequisite: graduate student in Clinical Psychology and consent of instructor. The seminar on the

NOTE: For key to footnote symbols, see page 123.

structured interactionist theory of Jean Piaget will include mastery of his theory of cognitive developmental stages, experience with methods of assessment and application of the core concepts to clinical psychopathology in children and adolescents. (S/U grading only.)

210. Design and Analysis in Clinical Research I (4) I. The Staff
Lecture—4 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. Basic statistical procedures, experimental design and correlational methods used in clinical research. Emphasis will be placed on those methodologies having the broadest application to contemporary clinical investigation.

211. Design and Analysis in Clinical Research II (4) II. The Staff (Abramowitz in charge)
Lecture—3 hours; discussion—1 hour. Prerequisite: graduate student in Clinical Psychology; course 210 (or the equivalent) or consent of instructor. Specialized methods for clinical research. Quasi-experimental, analogue, archival, single-subject and other methodological alternatives available to the clinical researcher will be reviewed.

212. The Psychology of Women (3) III. Pepitone-Rockwell
Seminar—3 hours. Prerequisite: consent of instructor. Course will trace developmental path of women—from birth to death. Implications for psychotherapy and coping styles will be explored. (S/U grading only.)

213. Theories of Psychotherapy (1-6) I, II, III. The Staff
Discussion—1-6 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. Major theories of psychotherapy will be examined and compared. Implications for therapeutic technique and personality change will be studied. May be repeated for credit. (S/U grading only.)

214. Psychotherapy Practicum (1-3) I, II, III, IV. The Staff
Discussion—1½ hours; clinical field placement—6 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. Supervision and discussion of clinical cases within the framework of specific models of psychotherapy. May be repeated for credit. (S/U grading only.)

215. Assessment Practicum (1-3) I, II, III, IV. The Staff
Laboratory—2-9 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. Students will select the specific tests they need training in and will get consent of the instructor offering supervision. Students will also write assessment reports including their interpretation of test results and have them discussed with supervisor. May be repeated for credit. (S/U grading only.)

216. Psychological Assessment I (3) I, III Bell and staff
Seminar—3 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. To help the student acquire critical knowledge of the methods and problems of psychological assessment with emphasis upon the theory of administration and interpretation of tests of intellectual functions and other "objective" personality measures. (S/U grading only.)

217. Introduction to Projective Assessment (3) I, II, III. Bell and staff
Seminar—3 hours. Prerequisite: graduate student in Clinical Psychology or consent of instructor. To help the student acquire critical knowledge of the theories of projective techniques with emphasis upon the theory of administration and interpretation of the Rorschach and TAT for children and adults. (S/U grading only.)

220. Clinical Behavior Therapy (3) I, II, III. Hines
Discussion-seminar—3 hours; case study or term paper. Prerequisite: graduate student in Clinical Psychology or consent of instructor. Provides an overview of behavior therapy from the clinician's viewpoint, stressing the working philosophy and techniques of the behavior therapist. Techniques surveyed include relaxation training, systematic desensitization, implosion, modeling, role rehearsal, cognitive restructuring, contingency management, and self-control strategies. (S/U grading only.)

222. Professional Development and Ethics (1-4) III. Rockwell, Pepitone-Rockwell
Seminar—1-4 hours. Prerequisite: graduate student standing with consent of instructor. Course intended for future professional psychologists in order to examine areas of professional ethics, the social system and its impact on the professional, and the professionalization processes. (S/U grading only.)

299. Research (1-12) I, II, III, IV. The Staff
Prerequisite: graduate student in Clinical Psychology or 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. Borhani and staff
Lecture—2 hours; discussion—1 hour. Prerequisite: undergraduate standing. Lectures and discussions to consider in a comprehensive manner the responsibilities, obligations, and role and professional activities of various disciplines of health manpower in the community, and to orient the students with perspectives of medicine in society.

121. Introduction to Medical Ecology (3) III. The Staff
Lecture—2 hours; discussion—1 hour. Prerequisite: upper division or graduate student with interest in health sciences, human ecology, or related areas. Focus on principles of medical ecology as they relate to the study of the distribution and determinants of disease, or injury in human populations. The biological, physical and social environments are examined to show the causes, natural histories and ecological correlates of human illness.

160. Health Advocate Course (1-5) I, II, III, IV. Cooper (Student Health Center)
Laboratory—3-15 hours. Help in preparation for field work in area of health education. Learn to plan, present and evaluate small group programs on health issues, including: nutrition, exercise, lifestyles, stress management, responsible drinking and drug abuse. (P/NP grading only.)

180. Aging and Health (3) III. Weiler
Lecture—3 hours. Prerequisite: upper division standing and consent of instructor. Emphasis on nature and determinants of health in the elderly. Current social and personal strategies for enhancing and maintaining health in old age.

190. Seminar in Community Health (1) I, II, III, IV. The Staff
Seminar—1 hour; written evaluations and reports. Prerequisite: upper division or graduate student standing. Discussion of contemporary issues and topics in community health. (P/NP grading only.)

192. Externship in Community Health Practice (1-5) I, II, III, IV. The Staff
Externship—3-15 hours; field supervision evaluation; written progress report. Prerequisite: open to all senior and graduate students, and consent of instructor. The totality of community health practice is observed and compared to the concepts and theory seen in didactic instruction in this field-oriented course. (P/NP grading only.)

194. Practicum in Community Health Clinics (1-5) I, II, III, IV. The Staff
Clinic session—3-15 hours; written report. Prerequisite: upper division student standing. The undergraduate student, through active participation in the medical aspects of community health clinics, gains knowledge of their organization, administration, and problem solving capabilities of these primary care facilities. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Borhani in charge)
Discussion-seminar—1-5 hours; occasional visiting lecturer. Prerequisite: senior standing and consent of instructor. Directed group study on selected topics relating to community health. (P/NP grading only.)

199. Directed Individual Study (1-5) I, II, III, IV. The Staff (Borhani in charge)
Prerequisite: advanced undergraduate standing and consent of instructor. Directed individual group study on selected topics relating to community health. (P/NP grading only.)

Graduate Courses

201. Medical and Environmental Epidemiology (3) I, II, III, IV. Borhani
Lecture—2 hours; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures and discussions with laboratory exercises on the basic concepts of medical and environmental epidemiology as related to selected infectious, noninfectious or environmental disease processes including applications to: community health, medical ecology and prevention and disease control.

202. Community and Preventive Medicine (1-9) I, II, III, IV. 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.

203. Medicine and the Environment (2) I. Borhani
Lecture—1 hour; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures and seminar type open discussions and directed readings led by resident and guest lecturers on issues of environmental health as they relate to changing patterns or accelerated onset of disease.

204. Medical and Health Care Delivery Patterns (3) II, III. Borhani, Leonard, Bauer, Weiler
Lecture—2 hours; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures and seminar-type open discussions led by resident and guest lecturers on current problems and practices in medical health care practice: delivery organization and financing systems.

205. Issues in Community Health (2) I, II. Borhani, Bauer, Weiler
Lecture—1 hour; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Seminar type discussions and lectures on selected topics and problems in community health including population control, drug abuse, malnutrition, abortion, suicide, and public health problems of certain population groups.

206. Nutrition and Health (2) II. Borhani and staff
Lecture—1 hour; discussion—1 hour. Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Lectures, selected readings, and seminar discussions on nutritional aspects of community health. Emphasis is placed on the role of nutrition, on the distribution and determinants of disease in the community and the assessment of nutritional health status.

207. Political and Economic Determinants of Health Care (3) II. Borhani, Weiler, Tupper
Lecture—2½ hours; discussion—½ hour. Group study to obtain an understanding of the political and economic determinants of health-care systems. Each session consists of guest lecturer and discussion. Students select and read references from a reading list. (S/U grading for graduate students; P/NP grading for undergraduates.)

226. Psychiatric Implications of Legal Intervention (2) I, III. Bauer, Tupin (Psychiatry), Schuller
Discussion—2 hours. Prerequisite: consent of instructor. The influence of laws on human behavior, and vice versa, will be explored. Particular emphasis on youth and juvenile court procedure. Moot court demonstrations. (S/U grading only.) (Same course as Psychiatry 226.)

***252. Advanced Information Systems** (3) II. Walters
Lecture—2 hours; laboratory—2 hours. Prerequisite: must be able to perform at graduate level; experience in initial phases of data preparation, editing, and sorting; course 151 or the equivalent. To increase, through examples, projects and discussions, understanding of components of information systems, including hardware, software, economics and people, and to prepare students to apply this understanding in solution of specific problems in creation, design and implementation of information systems. (Same course as Biomedical Engineering 252.)

290. Current Topics in Community Health (1-3) I, II, III, IV. Borhani, Weiler, Tupper
Seminar—1-3 hours. Prerequisite: medical, graduate or veterinary students, or consent of instructor. Seminars, group discussions, lectures, and critique of current topics in community health, epidemiology, preventive medicine, or health care delivery. (S/U grading only for graduate students.)

291. Seminars in Epidemiology (1/2) II. Borhani
Seminar—1 hour. Prerequisite: graduate student standing; at least one course in epidemiology. Participants will present and discuss ongoing or published research projects in epidemiology. Emphasis will be on study design and data analysis. (S/U grading only.)

294. Practicum in Community Health Clinics (1-5) I, II, III, IV. Borhani
Clinic sessions—3-15 hours. Prerequisite: open to all first- or second-year medical students, or graduate students with consent of instructor. Students are assigned to clinical settings which demonstrate ethnic, urban/rural or other related aspects of clinical community health. The students, through active participation in health care delivery, are able to relate conceptual with practical aspects of primary health care. (S/U grading only for graduate students.)

298. Group Study in Community Health (1-5) I, II, III, IV. The Staff
Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Directed readings, discussions or community investigations in issues or problems in community health. (S/U grading only for graduate students.)

299. Research in Community Health (1-12) I, II, III, IV. The Staff
Prerequisite: medical, graduate, or veterinary students, or consent of instructor. Directed population and community based research in selected topics in community health. (S/U grading only for graduate students.)

Professional Courses

407. Foundations of Community Health I: Principles of Preventive Medicine, Epidemiology, and Biometry (2) II. Borhani and staff
Lecture—2 hours. Prerequisite: consent by Committee on Student Evaluation and Promotion. Lectures and problem-oriented discussions on chronic and infectious disease models, emphasis on principles of prevention, epidemiology and biometry. (Quarter VI of Medical School curriculum.)

408. Foundations of Community Health II: Preventive Medicine, Environmental Health, and Health Care Delivery (1.5) III. Borhani, Tupper, Bauer
Lecture—12 hours total; discussion—8 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Nature and control of environmentally dependent

NOTE: For key to footnote symbols, see page 123.

mortality/morbidity in various community/occupational settings and the nature, organization, financing and delivery of health care services, and how these affect disease prevention and quality of health care.

460. Geriatrics in Community Health (6-12) I, II, III, IV. Weiler
Discussion—4 hours; clinical activity—full time (4-8 weeks) clinical setting and community needs assessment. Prerequisite: fourth-year medical student. Opportunity to participate in state-of-the-art geriatric programs ranging from well elderly to severely infermed. Sites include San Francisco, Sonoma, Yolo and Contra Costa counties.

461. Group Practice in Community Health (6-18) I, II, III, IV. Borhani, ———
Prerequisite: third- or fourth-year medical students. Clinical preceptorships in ten-man private rural group practice. Southern Monterey County Medical Group, King City, California. Group demonstrates "one door" medical care for private and indigent farm labor families. (HEW Grant.) (Same course as Family Practice 461.)

465. Community Analysis and Public Health Practice Preceptorship (6) I, II, III, IV. Weiler
Discussion—4 hours; preceptorship—full time (4 weeks) community work data analysis and public health. Prerequisite: fourth-year medical students. Provides wide variety of practical training in epidemiology, health needs of underserved, control of communicable disease and toxics, and research.

Dermatology

Upper Division Courses

192. Internship in Cutaneous Biology (1-12) I, II, III, IV. The Staff (Gomez in charge)
Internship—3-36 hours; final report. Prerequisite: upper division standing or consent of instructor. Approval of project prior to internship by preceptor. Supervised work-study experience in dermatologic research and related fields. (P/NP grading only.)

199. Special Study in Cutaneous Biology (1-5) I, II, III, IV. The Staff (Gomez in charge)
Prerequisite: advanced undergraduate standing and/or consent of instructor. Special study by individual arrangement of specialized topics in biology of skin. Work may be assigned readings, laboratory research or a combination. (P/NP grading only.)

Professional Courses

420. Integumentary System (2) II. Gomez and staff
Lecture—15 hours, discussion—5 hours, laboratory—5 hours (25 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. The anatomical and functional relationship of the integument to the entirety of human organism discussed and demonstrated. Additionally, a morphologic approach based on lesion appearance to clinical dermatology. (Quarter V of Medical School curriculum.)

460. Dermatology Clinical Clerkship (1-18) I, II, III, IV. Huntley
Inpatient-outpatient service—40 hours (clinical activity). Prerequisite: completion of three years of medical school; consent of instructor. Observation of practicing dermatologist in daily work with patients and participation in Ward Rounds and Dermatology Clinics at UCD Medical Center. Limited Enrollment.

498. Special Topics in Clinical Dermatology (1-6) I, II, III, IV. The Staff (Huntley in charge)
To be arranged—3-18 hours. Prerequisite: medical students with consent of instructor. Individually arranged study of special topics in clinical dermatology determined by student and instructor. Assigned readings and/or clinical examination of selected patients.

499. Special Topics in Cutaneous Biology (1-6) I, II, III, IV. The Staff (Huntley in charge)
Individually arranged study of special topics in cutaneous biology selected by student and instructor.

Family Practice

Lower Division Courses

81. Preventive Health Care (2) II. Chang in charge, Rockwell; Jones (Student Health Center)
Lecture—2 hours; final examination. Students will learn preventive health care information that will enable them to live a healthier life. Emphasis will be placed on sexually transmitted diseases, mental health and drug abuse. (P/NP grading only.) (Same course as Medical Microbiology 81.)

92A-92B-92C-92D-92E-92F-92G-92H. Internship in Family Practice (3-3-3-3-3-3-3-3) I-II-III-IV-V-VI-VII-VIII. Scherger
Clinics—four 8-hour sessions; clinic meeting/discussion—1 hour; directed group committee work—8 hours. Prerequisite: consent of instructor; open to lower division students. Helpful if student is bilingual in Spanish. Course provides exposure to primary health care delivery within the Family Practice setting; treatment and diagnosis of episodic and acute illnesses; screening and treatment of chronic (long-term) illnesses; the physical examination; basic laboratory testing; the reception and intake of patient; uses of referral system. (P/NP grading only.)

92K. Health Science Practicum (3-5) I, II, III, IV. Smith (Student Health Center)
Laboratory—12 hours. Prerequisite: consent of instructor. Introduction of lower division students to health professions and health care delivery system through experience in clinical setting. (P/NP grading only.)

Upper Division Courses

110. Basic Office Skills for Primary Care Providers (1) I, White
Discussion—1 hour; laboratory—1 hour. Prerequisite: enrollment in Family Nurse Practitioner/Physician Assistant program. Techniques of basic office skills, medical terminology and the Physician Assistants law in California. (P/NP grading only.)

119A-119B-119C-119D. Clinical Preceptorship for Mid-level Health Care Providers (FNP/PA) (5-6, 5-6, 5-6, 5-6) I-II-III-IV. Joslin
Lecture—1 hour; laboratory—16-24 hours. Prerequisite: enrollment in Family Nurse Practitioner/Physician Assistant program; course 120A-120B-120C-120D (concurrently). Student spends 16-24 hours per week with physician preceptor in patient care to develop clinical skills necessary to assess and manage patients with common medical problems seen in primary care.

120A-120B-120C-120D. Fundamentals of Medicine for Mid-level Health Care Providers (FNP/PA) (5-5-5-5) I-II-III-IV. Trolinger, Morgan
Lecture—5 hours. Prerequisite: enrollment in Family Nurse Practitioner/Physician Assistant program. Study of anatomy, physiology, pathophysiology and clinical skills needed for assessment and mangement of common medical problems seen in patient care: approach to sympton diagnosis and treatment management of common medical problems.

121A-121B. Communication Skills and Role Development (2-2) I-II. Mentink
Seminar—2 hours. Prerequisite: course 120A (concurrently). Interview techniques, communication skills self awareness, awareness of others and their needs as they relate to patient care and the FNP/PA role.

121C. Behavioral Science: Influence on Patient Care (2) III. Mentink
Seminar—2 hours. Prerequisite: course 121A-121B. Students assess patient concerns and assist patients in reaching their own solutions.

121D. Behavioral Science: Influence on Patient Care (2) IV. Mentink
Seminar—2 hours. Prerequisite: course 121C. Students continue to assess patient concerns and assist patients in reaching their own solutions.

123. Advanced Medicine for FNP/PA (4) I, Morgan
Lecture—40 hours total (2 one-week blocks of 20 hours each, September and late November). Prerequisite: enrollment in Family Nurse Practitioner/Physician Assistant program; satisfactory completion of course 120A-120B-120C-120D. Extends the basics of primary care taught in course 120A-120B-120C-120D and includes less common more difficult conditons.

124. Clinical Geriatrics (4) I, Trolinger
To be arranged—lecture (28 hours total); laboratory (40 hours total). Prerequisite: enrollment in Family Nurse Practitioner/Physician Assistant program; satisfactory completion of course 120A-120B-120C-120D. Includes assessment, management of common problems related to special needs of elderly, including didactic and clinical modalities. Didactic information builds on basic learning in course 120A-120B-120C-120D. Includes opportunities to deal with social/political structures of skilled nursing facilities and reimbursement policies.

125. Health Promotion and Disease Prevention (4) II. Perry
Lecture—40 hours total. Prerequisite: enrollment in Family Nurse Practitioner/Physician Assistant program; satisfactory completion of course series, 120, 121, and 119. Theories of health promotion and disease prevention with application to clinical practice.

126. Advanced Gerontology (3) II. Trolinger
Lecture—30 hours total. Prerequisite: enrollment in Family Nurse Practitioner/Physician Assistant program; satisfactory completion of course series, 120, 121, asnd 119. General medical and surgical needs of the elderly, including physiologic and emotional needs as the health status of the older patient changes.

192A-192B-192C-192D-192E-192F-192G-192H. Internship in Family Practice (3-3-3-3-3-3-3-3) I-II-III-IV-V-VI-VII-VIII. Scherger
Clinics—four 8-hour sessions; clinic meeting/discussion—1 hour; directed group committee work—8 hours. Prerequisite: open to upper division students; satisfactory completion of course 92A through 92H and consent of instructor. Helpful if student is bilingual in Spanish. Based on the acquisition of skills derived in course 92. The student will now be in a position to be a health care member of Clinica Tepati as well as a teaching assistant. These quarters will include being responsible for leadership in reception intake routine lab techniques (under M.D. supervision). Taking vital signs, organizing and monitoring medical records and retrieval system. (P/NP grading only.)

192I-192J. Clinical Internship for FNP/PA (12-12) I-II.
Laboratory—36 hours. Prerequisite: course series 119 and 120. Designed to enhance clinical skills and to increase reponsibility of the Family Nurse Practitioner/Physician Assistant in providing patient care in an ambulatory setting. (P/NP grading only.)

192K. Health Science Practicum (3 or 5) I, II, III, IV. Smith (Student Health Center)
Fieldwork—9 hours (eight-week summer quarter); 15 hours (twelve-weeks other quarters); term paper. Prerequisite: consent of instructor. Introduction of upper division students to health professions and health care delivery system through experience in clinical settings. (P/NP grading only.)

Professional Courses

400A. Introduction to Patient Evaluation (1.5) I, Morgan
Lecture—6 hours, discussion—5 hours, and laboratory—9 hours (20 hours total). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Basic skills of structuring an interview: in the classroom; via interviews with actor-patient monitored by video for self-critique and patient feedback; and interviews in precepters' offices, clinics or hospitals. Quarter I of Medical School curriculum.

400B. Introduction to Patient Evaluation (1) II. Morgan and staff
Lecture—1 hour and laboratory—19 hours (20 hours total). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. In small groups with faculty supervision, students will learn and practice taking medical histories and performing physical examinations on each other and writing the histories and physicals in an acceptable manner. Quarter II of Medical School curriculum.

400C. Introduction to Patient Evaluation (1.5) III. Morgan and staff
Lecture—1 hour, discussion—2 hours, and laboratory—22 hours (25 hours total). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Students will visit two preceptors in different sites to perform interviews and physical examinations on patients under preceptor supervision. Preceptorship also structures study of concepts and organization of primary care and family practice. Quarter III of Medical School curriculum.

401. Elective Preceptorship in Family Practice (2) I, II, III, IV. Scherger
Preceptorship—part-time (one 4-hour day per week; 10 weeks) or full-time (40-hour week per 1.5 units; 4 to 6 weeks). Prerequisite: medical students with consent of instructor. Student preceptorship in family physician's office as an introduction to clinical medicine.

***402. Introductory Medical Spanish** (1) III. Davidson
Discussion—2 hours. Prerequisite: restricted to medical students in good academic standing. Students learn vocabulary needed to conduct a basic medical history and physical in Spanish. (S/U grading only.)

407. Primary Care at Free Clinic (2) I, II, III, IV. Chang, Jones (Student Health Center)
Discussion—1 hour; laboratory—½ hour; practicum—1½ hours. Prerequisite: second-year medical students with consent of instructor. Diagnose and treat simple illnesses at Davis Free Clinic under supervision of instructors. Learn alternate way of delivering primary care at low cost to patient and/or community.

410A-410B-410C. Analysis of Health Care Delivery Systems (2-2-2) I-II-III. Program Staff (Mitchell in charge)
Lecture—2 hours. Prerequisite: graduate student standing; admitted to M.H.S. degree program. (410A) Designed to provide an overview of health care delivery systems, including historical evolution, system characteristics, structure and incentives; (410B) addresses utilization of services and providers of services; (410C) addresses defining and meeting health service needs.

411A-411B-411C. Family and Community Concepts (2-2-2) I-II-III. Program Staff (Mitchell in charge)
Lecture—2 hours. Prerequisite: graduate student standing; admitted to M.H.S. degree program. (411A) Designed to provide an introduction to the individual as part of a family and community; (411B) addresses impact of illness on the family; and (411C) addresses alternative models for care.

412A-412B-412C. Organizational Behavior and Organizational Development in Health Care (2-2-2) I-II-III. Program Staff (Mitchell in charge)
Lecture—2 hours. Prerequisite: graduate student standing; admitted to M.H.S. degree program. (412A) Provides an

NOTE: For key to footnote symbols, see page 123.

introduction to the behavior of organizations in the health care system; (412B) covers organizational development issues and patterns; (412C) addresses inter-organizational conflict in health systems.

420A-420B-420C. Advanced Clinically-Related Study (2-2-2) I-II-III. Program Staff (Mitchell in charge)
Directed study—approximately 8 hours. Prerequisite: graduate student standing; admitted to M.H.S. degree program. Each student will complete three quarters of supervised applied clinically-related study, to provide balance between classroom discussions and application of ideas that are being addressed.

429A-429B-429C-429D. Current Topics in Health Care Delivery (1-3) I-II-III-IV. Mitchell
Literature research, community research, discussion, seminars combined—40-120 hours. Prerequisite: admitted to M.H.S. degree program. Supervised study of current topics in health care delivery through literature research, community research, and professional seminars; preparation of reports and papers synthesizing and analyzing the study results. Elective course.

434A-434B-434C-434D-434E-434F-434G-434H. Primary Care at Clinica Tepati (3-3-3-3-3-3-3-3) I-II-III-IV-I-II-III-IV. Scherger
Clinics—four 8-hour days; group seminar/discussion—ten 1-hour sessions; training session/lecture—four 2-hour sessions. Prerequisite: first- and second-year (full-time) medical students with consent of instructor; pre-application processed. Exposure to episodic and acute disease; learn physical examination and taking a complete history; also learn immunization techniques, use of laboratory tests. Limited enrollment. (S/U grading only.)

435A-435B-435C-435D-435E-435F-435G-435H. Primary Care at Clinica Tepati (3-3-3-3-3-3-3-3) I-II-III-IV-I-II-III-IV. Scherger
Clinics—four 8-hour days; group seminar/discussion—ten 1-hour sessions; training session/lecture—four 2-hour sessions. Prerequisite: third- and fourth-year (full-time) medical students with consent of instructor; pre-application processed. Counseling, diagnosis, and treatment of patients with chronic (long-term) and acute (short-term) disease under supervision of a physician; as well, exposure to other special health-care needs of ethnic groups, and poor people in general. (S/U grading only.)

439A-439B-439C-439D. Special Study of Health Care Organizations (1-3) I- II-III-IV. Mitchell
Special study—40-120 hours. Prerequisite: admitted to M.H.S. degree program. Supervised study of health care organizations through on-site observation and analysis of hospitals, nursing homes, and other types of facilities; preparation of reports and papers synthesizing and analyzing the study results. Elective course.

449A-449B-449C. Research Methods and Effective Teaching Skills (2-2-2) I-II-III. Program Staff (Mitchell in charge)
Lecture—2 hours. Prerequisite: graduate student standing; admitted to M.H.S. degree program. (449A) Provides an introduction to research methods and statistical analysis; (449B) covers teaching skills in the individual setting; and (449C) includes teaching skills in the group.

450A-450B-450C. Primary Care Research Practicum (2-2-2) I-II-III. Program Staff (Mitchell in charge)
Directed study/research project—approximately 8 hours. Prerequisite: graduate student standing; admitted to M.H.S. degree program. Students will complete a supervised research project in health services in order to make practical application of classroom discussions.

462. Family Practice Preceptorship (3-18) I, II, III, IV.——, Scherger
Clinical activity—full time (3 days per unit). Prerequisite: completion of third year of medical school or medical student with consent of instructor. Preceptorships with primary care physicians in a variety of settings. Involvement in direct patient care and daily activities under supervision of physician-preceptor.

463. Selected Reading in Family Practice (1-9) I, II, III, IV. Scherger
Discussion—3-27 hours. Prerequisite: medical students with consent of instructor. Provides students with overview of the literature in family medicine and common problems encountered in family practice; and discuss concepts related to literature. (S/U grading only.)

468. Family Practice in a Foreign Culture (6-18) I, II, III, IV. ——, Scherger
Clinical observation—50-55 hours. Prerequisite: completion of third year in medical school. Visit a family practitioner in a foreign country (arranged in advance by Department), accompany and participate in clinic activities of preceptor and analyze and report characteristics of the practice.

469. Family Practice Clerkship (3-18) I, II, III, IV. The Staff (Scherger in charge)
Clinical activity—full-time. Prerequisite: third- and fourth-year medical students with consent of instructor (third-year students may elect to enroll for second half of spring quarter). Involvement in comprehensive primary medical care of patients in a family setting and observe the team approach to health care.

475. Fundamentals of Medical Psychology (3) I, II, III, IV.
Lecture—1½ hours; discussion—1½ hours. Prerequisite: consent of instructor. "Fundamentals of Psychological Medicine" focuses on the participants' intra- and interpersonal patterns of response to interpersonal interactions. A model for reducing interpersonal stress is presented and participants are required to videotape one interview using this model. Role-playing is used extensively as well as the dynamics of interactions between group members. (S/U grading only.)

476. Physiological Medicine Clinic (2) I, II, III, IV. May
Discussion—4 hours. Prerequisite: course 475; consent of instructor. Etiology of psychosomatic symptoms and three strategies for effecting change in those symptoms: hypnosis, progressive relaxation/imagery, and biofeedback. Under instructor supervision, students conduct therapy with patients utilizing one of three proferred methods. This is an intensive practicum experience in psychological medicine. (S/U grading only.)

498. Directed Group Study in Family Practice (1-9) I, II, III, IV. Scherger
Discussion—3-37 hours. Prerequisite: medical students with consent of instructor. Directed study on selected topics relating to family medicine and primary health care delivery; visits to and written analysis of selected innovative health care programs. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Scherger in charge)
Prerequisite: medical students with consent of instructor. Research in various aspects of the health care delivery system. (S/U grading only.)

Human Anatomy

Upper Division Courses

101. The Gross and Microscopic Structure of the Human Body (4) II. Hunter, Patterson
Lecture—4 hours. Prerequisite: Biological Sciences 1 or 10; Physiology 2-2L or Zoology 2-2L recommended. A study of the gross and microscopic structure of the human body with emphasis on function.

101L. The Gross and Microscopic Structure of the Human Body (2) II. Hunter, Patterson
Laboratory—two 3-hour sessions. Prerequisite: course 101 (may be taken concurrently). Laboratory will be taught from prosections, models and slides to give students the opportunity to learn structure from direct experience.

192. Internship in Morphology (1-12) I, II, III, IV. The Staff
Work-learn experience—3-36 hours; final report. Prerequisite: upper division standing; laboratory science experience including some chemistry; approval of project by perceptor prior to period of work learn. Experience of supervised work study in research laboratories of members of the Department. (P/NP grading only.)

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

Graduate Courses

200. Gross Anatomy (8) I.
Lecture—3½ hours; discussion—1 hour; laboratory—10½ hours. Prerequisite: graduate student status and consent of instructor. To provide students with a vocabulary of human body structure and to acquaint them with structural relationships through dissection and lecture and to introduce them to functional aspects of gross anatomy, particularly as regards anatomical problem solving.

201. Human Embryology (2) I. Hendrickx
Lecture—2 hours. Prerequisite: graduate student status and consent of instructor. Developmental anatomy of the human from fertilization to parturition including the origin of basic form of the embryo, development of the organ systems, and nature of anomalous development.

202. Human Microscopic Anatomy (6) II. Enders
Lecture—3 hours; discussion—2 hours; laboratory—6 hours (including periodic reviews). Prerequisite: graduate status; biochemistry, physiology (may be taken concurrently). Structure of cells and tissues will be studied from the organellar or in some cases molecular level to that of organs relating structure to the general and specific functions of the cells and organs in the human body.

203. Human Neuroanatomy (6) III. Gross
Lecture—5 hours; laboratory—3 hours. Prerequisite: consent of instructor. Macroscopic anatomy of the nervous system to include its relationship to coverings, topography, and blood supply. Microscopic anatomy, pathways and internal organization of the nervous system.

205. Biology of Mammalian Gametes and Fertilization (2) III. Meizel
Lecture—½ hour; discussion—1½ hours. Prerequisite: lecture courses in biochemistry, cell biology (or histology), and physiology (with some endocrinology); consent of instructor. Biochemical and ultrastructural aspects of normal mammalian gametes and fertilization. Emphasis on mechanisms essential for fertilization. Several background lectures will be followed by reading and critical analysis of relevant literature. Offered in odd-numbered years.

206. Advanced Human Neuroanatomy (3) I, Gross, V.K. Vijayan
Lecture—3 hours. Prerequisite: basic neuroanatomy course equivalent to course 203 (former course 201); consent of instructor. Detailed study of selected topics not included in course 203. Together these two courses will give students a comprehensive knowledge of neuroanatomy, stressing the anatomic basis for neural function and dysfunction. Offered in odd-numbered years.

208. Comparative Biology of the Placenta (2) III. King
Lecture—1½ hours; discussion—½ hour. Development and microscopic structure of the placenta and fetal membranes of major domestic and laboratory animal species and the human analyzed and related to the various functions of the placenta in supporting the fetus. Offered in odd-numbered years.

290. Seminar (1) I, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

290C. Research Group Conference (1) I, II, III. Enders and staff
Discussion—1 hour. Prerequisite: graduate student with research experience (may be taken concurrently); consent of instructor. Discussion of problems, progress and literature relevant to current research undertaken by laboratory groups in Human Anatomy. (S/U grading only.)

298. Advanced Group Study (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor

299. Research (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

400. Gross Anatomy (7.5) I, Erickson and staff
Lecture—30 hours and laboratory—115 hours (145 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. To provide students with a vocabulary of human body structure, to acquaint them with structural relationships through dissection and lecture and to introduce them to functional aspects of gross anatomy, particularly as regards anatomical problem solving. (Quarter I of Medical School curriculum.)

401. Human Embryology (2) I. Hendrickx
Lecture—20 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Developmental anatomy of the human from fertilization to parturition including the origin of basic form of the embryo, the development of the organ systems and the nature of anomalous development.

402. Human Microscopic Anatomy (5) II. King and staff
Lecture—30 hours; review—3 hours; laboratory—57 hours (90 hours total). Prerequisite: medical students in good standing. Structure of tissues and cells of organs of the human body. Particularly concerned with structural context of normal function and is designed not only to acquaint students with the human organism but also to prepare them for structural analysis of abnormal function (pathology).

403. Neuroscience (5) III. Gross and staff
Lecture—40 hours; discussion—12 hours; laboratory—25 hours (77 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Neurophysiology and neuroanatomy of the normal human nervous system considered in an integrated format. Laboratories involved, both morphology and microscopic anatomy, and examples of physiologic activity. (Same course as Human Physiology 403.)

***412. Developmental Human Anatomy** (4) I. Barry
Lecture—2 hours; discussion—2 hours; laboratory—2 hours; laboratory reports. Prerequisite: second-year medical students or consent of instructor. Comprehensive survey of morphological development of the human body, with emphasis on urogenital and cardiovascular systems. Laboratory includes study of serially sectioned mammalian material and reconstructions. Discussion will emphasize student participation. Limited enrollment.

498. Advanced Group Study (1-12) I, II, III, IV. The Staff
Prerequisite: medical students, interns, and residents with consent of instructor. Directed reading and group discussion and/or laboratory experience on selected topics. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

Human Physiology

Upper Division Courses

192. Internship in Human Physiology (1-12) I, II, III, IV. The Staff (Renkin in charge)
Work-learn experience—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-study experience in physiology and related fields. (P/NP grading only.)

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—3-15 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. Curry, Cala
Lecture—3 hours. Prerequisite: Biochemistry 101B, Chemistry 110B, Physiology 100B; graduate standing and consent of instructor. Physiochemical basis of living systems with emphasis on membrane permeability of characteristics at both the cellular and tissue level. Offered in even-numbered years.

***213. Cellular Physiology of Excitable Membranes** (4) I, Scobey
Lecture—2 hours; discussion—1 hour; 1 hour problem sets or written review per week. Prerequisite: elementary physics and calculus. Beginning with electrochemistry, this course uses elementary calculus and physics for lectures and problem sets on diffusion potentials, electrotonic conduction, synaptic transmissions, etc. Several topics will be covered by invited lecturers on their research interests. Offered in odd-numbered years.

231. Renal Physiology (3) I, Rabinowitz
Lecture—3 hours. Prerequisite: Physiology 112, 113 or the equivalent; graduate standing. Topics in mammalian renal physiology and related areas of biological transport, fluid and electrolyte homeostasis, comparative renal physiology, and pathophysiology of the kidney in man. Offered in odd-numbered years.

***231L. Renal Physiology Laboratory** (1) I, Rabinowitz
Laboratory—3 hours. Prerequisite: Physiology 112, 113 or the equivalent; graduate standing and consent of instructor. Experimental study of renal function in mammals including measurement of renal blood flow, filtration rates, concentrating ability, excretion of ions and the action of hormones and drugs. Offered in odd-numbered years.

250. Circulatory Transport and Fluid Exchange (3) I, Renkin
Lecture—2 hours; discussion—1 hour. Prerequisite: Physiology 112-113-114 or courses 400-403-418 or the equivalent; or consent of instructor. Lectures, assigned reading and discussion of: principles of microcirculatory exchange; blood, interstitial fluid and lymph dynamics; regulation of plasma and interstitial fluid volume; disturbances of plasma and interstitial fluid exchange; fluid replacement. Offered in even-numbered years.

260. Physiological Systems Analysis (5) I, Smith
Lecture—4 hours; discussion—1 hour. Prerequisite: Mathematics 22B and Physiology 113; or consent of instructor. Quantitative analysis of physiological control systems; mathematical models and analytic methods appropriate for the study of different types of physiological control; application of these techniques to investigation of homeostasis. Offered in odd-numbered years.

261. Simulation of Physiological Systems (1-3) I, II, III, IV. Smith
Laboratory—3-9 hours. Prerequisite: course 260 or the equivalent; consent of instructor. Selected problems in simulation of physiological control systems. Simulations performed on current microcomputer hardware using high level simulation languages. Problems may be selected from literature or from student's research; experimental testing of the simulation encouraged.

280. Pulmonary Function Evaluation (4) I, II, III. Cross
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 400 or the equivalent and consent of instructor. (Same course as 480.)

285. Peripheral Circulation (3) III. Gray
Lecture—1 hour; discussion—2 hours. Prerequisite: Physiology 113, 111B, or the equivalent and consent of instructor. Course will consist of a series of lectures and discussion sessions on the physiology of mammalian peripheral circulation including topics on: anatomy, physiology, and pharmacology of vascular smooth muscle, regional circuits, microcirculatory control mechanisms, and dynamics of capillary transport. Offered in even-numbered years.

298. Group Study (1-5) I, II, III, IV. The Staff (Renkin in charge)
Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved.

299. Research (1-12) I, II, III, IV. The Staff (Renkin in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

400. Human Physiology (8) II. Smith and staff
Lecture—6 hours; laboratory—7 hours. Prerequisite: consent by Committee on Student Evaluation and Promotion. Open only to first-year medical students. General, cellular and systemic physiology of cardiovascular, respiratory, gastrointestinal and urinary systems. (Quarter II of Medical School curriculum.)

403. Neuroscience (5) III. Carlsen, Vijayan, Gross, Scobey, O'Rahilly
Lecture—40 hours; discussion—12 hours; laboratory—25 hours (77 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Neurophysiology and neuroanatomy of the normal human nervous system considered in an integrated format. Laboratories involved, both morphology and microscopic anatomy, and examples of physiologic activity. (Same course as Human Anatomy 403.)

418. Mammalian Endocrinology and Homeostasis (5) III. Turgeon, Walsh and staff
Lecture—50 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Biochemical, physiological and anatomical properties of mammalian endocrine system. Physiological and biochemical principles that regulate homeostasis, especially in organ-organ interrelationships of metabolites and minerals. (Same course as Biological Chemistry 218A and 418.)

480. Pulmonary Function Evaluation (4) I, II, III. Cross
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 400 or the equivalent; consent of instructor. Clinical laboratory, physiological evaluations of pulmonary function. (Same course as 280.)

498. Directed Reading and Group Study (1-4) I, II, III, IV. Renkin and staff
Discussion—2-8 hours. Prerequisite: medical student. Directed reading and discussion on selected topics in human physiology. (S/U grading only.)

499. Research (1-6) I, II, III, IV. Renkin and staff
Prerequisite: medical students with consent of instructor. Laboratory investigation on selected topics. (S/U grading only.)

Internal Medicine—Core Courses

Upper Division Course

192. Internship in Internal Medicine (1-12) I, II, III, IV. The Staff
Work-learn experience—3-36 hours; final report. Prerequisite: upper division standing. Supervised work-study experience in internal medicine and related fields. (P/NP grading only.)

Professional Courses

400. Introduction to Emergency Medicine (1.5) I, Fisher and staff
Clinical activity—20 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Basic CPR with American Heart Association certification; first aid including splinting, bandaging, control of bleeding and transportation; evaluation of the whole patient and prioritization of evaluation and treatment; mechanisms of injury; exposure to pathophysiology of specific problems. (Quarter I of Medical School curriculum.)

401A. Physical Diagnosis Practicum (2) II. Watson-Williams
Lecture—1 hour, discussion—1 hour, and clinical activity—4 hours (30 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Students spend 6 days at one of the University or affiliated hospitals or in office of a medical faculty person, learning and practicing clinical skills. Additional time will be in a preceptorship, course 401B. (Quarter VI of Medical School curriculum.) (Deferred grading only, pending completion of course sequence.)

401B. Physical Diagnosis Practicum (1) III. Watson-Williams
Individual study—1 hour; clinical practicum—six 3-hour sessions. Prerequisite: consent by Committee on Student Evaluation and Promotion. School of Medicine faculty members will supervise, as preceptors, one or two students each session. They will meet at least six times with a suitable patient for students to develop individual clinical skills. (Quarter VII of Medical School curriculum.) (Deferred grading only, pending completion of course sequence.)

402. Occupational Medicine (1) II. Schenker
Lecture—1 hour. Prerequisite: consent by Committee on Student Evaluation and Promotion. Introduction to principles of occupational medicine. Diagnosing disease due to occupational exposure, occupational diseases of the lungs, skin, nervous and reproductive systems, cancer of occupational origin. Occupational epidemiology and legal/legislative aspects of occupational medicine discussed. (Quarter VI of Medical School curriculum.)

419. Introduction to Clinical Nutrition (3) IV. Halsted, Rucker
Lecture—30 hours total. Prerequisite: completion of first year of School of Medicine; consent by Committee on Student Evaluation and Promotion. Integrates basic concepts of human nutrition-dietary allowances; energy, protein, vitamin and mineral requirements, and metabolism—with current knowlege of the role of nutrition in diseases—obesity, alcoholism, lipidemias, intestinal disorders, aging. (Quarter IV of Medical School curriculum.) (Same course as Biological Chemistry 419.)

420A. Hematopoietic Organ System: Hematopoietic and Lymphoreticular System (4) I, Lewis and staff.
Lecture—25 hours, discussion—8 hours, and laboratory—22 hours (55 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Foundation in hematology basic principles necessary for third- and fourth-year of medical school. Intensive effort on principles of investigation and diagnosis rather than the details of blood disease management. Principles of general oncology. (Quarter V of Medical School curriculum.)

420B. Pathophysiologic of Digestive Diseases: Gastrointestinal System (3.5) I, Pimstone and staff
Lecture—31 hours; discussion—9 hours (40 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Basic emphasis on pathophysiologic basis of gastroenterological and hepatic disorders. Case discussions and symposia held primarily to exemplify basic principles covered by lectures. (Quarter V of Medical School curriculum.)

420C. Respiratory System: Pathophysiology of Respiratory System (4) II. Siefkin and staff
Lecture—3 hours; discussion—2 hours. Prerequisite: consent by Committee on Student Evaluation and Promotion. Foundation of integrative pathophysiology of the human respiratory system. (Quarter VI of Medical School curriculum.)

420D. Principles of Cardiovascular Medicine (4) II. Laslett and staff
Lecture—3 hours; discussion—2 hours. Prerequisite: consent by Committee on Student Evaluation and Promotion. Introduction to principles of diagnosis and management of cardiovascular disorders. (Quarter VI of Medical School curriculum.)

420E. Urinary System (3.5) III. Gulyassy, Lewis and staff
Lecture—24 hours; discussion—18 hours; laboratory—10 hours (52 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Fundamental aspects of (a) disorders of body water, electrolytes and acid/base balance; (b) major categories and mechanisms of parenchymal renal diseases; (c) major congenital and acquired urologic diseases; (d) urinary tract infections. (Same course as Urology 420.) (Quarter VII of Medical School curriculum.)

420F. Endocrine Metabolic-Regulatory (4.5) III. The Staff
Lecture—38 hours; discussion—14 hours (52 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Basic understanding of pathophysiological processes in organs and tissues primarily involved in metabolic regulation and sufficient factual base so that clinical and laboratory findings, diagnosis and elementary management of patients with endocrinological disorders can be rationalized. (Quarter VII of Medical School curriculum.)

461. Problems in Internal Medicine (6 or 9) I, II, III, IV. Hoppin
Clinical activity—full time (4 or 6 weeks). Prerequisite: satisfactory completion of third year of medical school; consent of instructor. Study of inpatients hospitalized on Medical Service. Experience in Internal Medicine at Woodland Clinic and Hospital. Daily rounds, mornings with instructor, Monday through Friday; afternoons patient assignments. Teaching conferences and combined radiology-pathology medicine seminars. Weekly allied specialty conference.

462. Externship in Medicine (1-21) I, II, III, IV. Fitzgerald and staff
Externship—full time (4, 8, or 12 weeks). Prerequisite: Medical Sciences 431; demonstrated ability to accept responsibility; consent of instructor. Student assumes role of acting intern and will be primary physician on medical ward under direction of medical resident and staff. Responsibility for patients admitted to acting intern and take call every fourth-night. Also taken at Children's S.F. Hospital. Limited enrollment.

463. Acting Internship in Medicine Intensive Care Unit (MICU) (9) I, II, III, IV. Parsons
Clinical activity—full time. Prerequisite: completion of third year in medical school; consent of Director of MICU. At UCD Medical Center, student functions as acting intern on MICU service under direction of medical resident and staff. Responsibility for patients admitted to MICU. On call in hospital every third night. Limited enrollment.

***464. Preceptorship in Medicine** (1-18) I, II, III, IV. Kassis
Preceptorship—5 or 10 weeks. Prerequisite: completion of

NOTE: For key to footnote symbols, see page 123.

third year in medical school; consent of Chairperson. Preceptorship in internal medicine with Frederick J. Kassis in his office and hospital practice of internal medicine in Rupert, Idaho. Limited enrollment.

465. Internal Medicine and Subspecialties in Outpatient Clinic: VA Outpatient Clinic (6-18) I, II, III, IV. Grecu and staff
Clinical activity—full time (4 or 12 weeks); includes conferences and lectures. Prerequisite: completion of third year of Medical School. Participation with members of specialty (internal medicine) and subspecialty (cardiology, gastroenterology, endocrinology, pulmonary and immunology-allergy) in the initial clinical evaluation, work-up, management and follow-up of patients in outpatient clinical setting. Limited enrollment.

466. Occupational and Environmental Medicine Elective (6-12) I, II, III, IV. Schenker
Clinical and laboratory experience—full time (4-8 weeks). Prerequisite: fourth-year medical student and consent of instructor. Participate in activities of Occupational and Environmental Health Unit. Major activity is involvement in an epidemiologic research project of the unit. Also participate in ambulatory Occupational and Environmental Medicine Clinic at UCD Medical Center.

472. Clinical Pharmacology and Toxicology (5-10) I, III. Winters and staff
Lecture—2 hours; seminar—3 hours; ward rounds—6 hours. Prerequisite: third- and fourth-year medical students. Basic principles of pharmacology and toxicology will be related to diagnosis and treatment of drug induced problems as well as principles of therapy. (S/U grading only.) (Same course as Pharmacology 472.)

498. Group Study in Internal Medicine (1-18) I, II, III, IV. The Staff (Silva in charge)
Prerequisite: consent of instructor. Special study for medical students which may involve laboratory or library research, ambulatory or inpatient care responsibility on campus, at UCD Medical Center or off campus by specific arrangement. (S/U grading only.)

Internal Medicine—Cardiology

Professional Courses

401. Clinical Cardiology Clerkship: Kaiser (3-18) I, II, III, IV. The Staff (Chairperson in charge)
Clinical clerkship (4 weeks)—8-12 hours (hospital); 1-5 hours (clinics). Prerequisite: third- and fourth-year medical students with advance approval by Cardiology Division, Department of Internal Medicine, and the Dean's Office. Emphasis placed on history taking and physical examination of pediatric and adult patients with congenital and acquired cardiovascular disease. Hospital rounds in CCU and elsewhere. The roles of ECG, PCG, and cardiac fluoroscopy, etc., in office cardiology will be evaluated. May be repeated for credit. Limited enrollment.

460. Cardiology Clinical Clerkship: Consult Service (3-18) I, II, III, IV. Cardiology staff
Inpatient-outpatient service (4 weeks)—full time (40 hours). Prerequisite: third- and fourth-year medical students with advance approval by Cardiology Division, Department of Internal Medicine, and the Dean's Office. Participation with members of subspecialty consultation service in initial clinical evaluation, workup, management, and followup of patients with cardiologic disorders. May be repeated for credit. Limited enrollment.

461. Management of Coronary Artery Disease: Coronary Care Unit (3-18) I, II, III, IV. The Staff
Inpatient service—full time (4 weeks). Prerequisite: completion of second year of medical school and advance approval by Cardiology Division, Department of Internal Medicine, and the Dean's Office. Research in laboratory and exercise testing to be determined by instructor. Current methods of clinical research involving certain aspects of diagnosis and treatment. Includes acute coronary care, hemodynamic monitoring, stress testing, cardiac catheterization, pathologic correlations and the modern approach to therapy, both medical and surgical, based on pathophysiologic mechanisms. May be repeated for credit. Limited enrollment.

462. Cardiology Clinical Clerkship: Martinez VA Hospital (3-18) I, II, III, IV.
Lecture—1-2 hours; discussion—8 hours; seminar—2 hours; clinical consultation—20-25 hours. Prerequisite: third- and fourth-year medical students with advance approval by Division of Cardiology, Martinez VA Hospital, and consent of instructor. Clinical evaluations in cardiology under supervision of a medical resident and attending physician. Active participation in seminars and conferences. Limited enrollment.

498. Special Group Study: EKG Unit (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Special study—2-week sessions. Prerequisite: medical students with advance approval by monthly attending faculty. Special group study in cardiology for medical students in EKG unit. May include lectures, directed reading, and/or discussion groups. May be repeated for credit. (S/U grading only.) Limited enrollment.

499. Research (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Internal Medicine—Emergency Medicine

Professional Courses

460. Emergency Medicine Clerkship (6 or 12) I, II, III, IV. Fisher
Clinical clerkship—full time (4 or 8 weeks). Prerequisite: completion of third-year basic medicine and surgery clerkships. Clerkship provides clinical experience. Under supervision of the faculty, students see and evaluate patients. Student will be exposed to a broad range of Emergency Room (ER) problems with goals of understanding the pathophysiology, diagnosis and management of important problems presented to the Emergency Room.

461. Acute Care Clerkship (6-9) I, II, III.
Lecture-discussion; clinical clerkship—30 hours (4- to 6-week clinical rotation). Prerequisite: third- or fourth-year medical students; Medical Sciences 431 or the equivalent third-year clerkship. At Acute Care Clinic, UCD Medical Center, students will perform initial evaluation of adults presented with complaints of a wide variety of acute and episodic illnesses. Emphasis will be on dermatology, gynecology, orthopaedics, and otolaryngology. (S/U grading only.)

465. Acting Internship in Emergency Medicine (6-12) I, II, III, IV. Fisher
Clinical clerkship—full-time (4 to 8 weeks). Prerequisite: satisfactory completion of course 460. Acting internship provides clinical experience in emergency medicine. Students are assigned to the regular Emergency Department intern schedule and under the supervision of the faculty, see and evaluate Emergency Room (ER) patients with responsibility similar to an intern.

499. Research (6-18) I, II, III, IV. Fisher
Laboratory—40 hours; research—full time (4 to 12 weeks). Prerequisite: consent of instructor. Elective where topics may be selected in either basic or clinical research areas of Emergency and/or Critical Care Medicine. The goals will be tailored to each individual student. Enrollment requires prior discussion and consent of instructor.

Internal Medicine—Endocrinology

Graduate Course

299. Research (1-12) I, II, III, IV. The Staff (Walter in charge)
Prerequisite: consent of instructor. Endocrinology research. (S/U grading only.)

Professional Courses

460. Endocrinology Clinical Clerkship (5-18) I, II, III, IV. Walter and staff
Inpatient-outpatient clinical activity—full time (3 days per unit). Prerequisite: Medical Sciences 431 and/or consent of instructor. Participation with members of subspecialty service in the initial evaluation, work-up, management and follow-up of patients with endocrinologic disorders. Both inpatient and outpatient experience. Limited enrollment.

465. Endocrinology Clinical Clerkship (9 or 18) I, II, III, IV. Noth
Lecture–discussion–seminar; clinical consultation—20-25 hours. Prerequisite: fourth-year medical students with consent of instructor. Clinical consultations in endocrinology at Martinez VA Hospital under supervision of medical resident and attending physician. Participation in seminars and conferences.

499. Research (1-12) I, II, III, IV. The Staff (Walter in charge)
Prerequisite: consent of instructor.

Internal Medicine—Gastroenterology

Professional Courses

460. Clinical Clerkship (3-18) I, II, III, IV.
Inpatient-outpatient clinical activity—40 hours. Prerequisite: successful completion of third year and consent of instructor. Participation with members of subspecialty service in the initial clinical evaluation, work-up, management and follow-up of patients with gastroenterologic disorders. May be repeated for credit.

462. Gastroenterology Clinical Clerkship (1-18) I, II, III, IV.
Inpatient-outpatient clinical activity—40 hours. Prerequisite: successful completion of third year and consent of instructor. Participation with members of subspecialty service in the initial clinical evaluation, work-up, management and follow-up of patients with gastrointestinal disorders.

499. Research (1-12) I, II, III, IV. Pimstone, Halsted, Trudeau, Jacobs
Prerequisite: medical student status; consent of instructor. Part-time participation in active clinical and basic research projects. Some will involve both patient care and relevant laboratory procedures. Basic research includes liver metabolism, cancer markers, porphyrias diet and cancer, folate metabolism. Clincal: varied.(S/U grading only.)

Internal Medicine—General Medicine

Professional Courses

460. General Medicine Consults (1-18) I, II, III, IV. The Staff (Division Chief in charge)
Inpatient-outpatient clinical activity—40 hours. Prerequisite: fourth-year medical students with consent of instructor; a general medicine clerkship. Supervised opportunity to see entire spectrum of medical problems encountered by a general internist. Student spends time in General Medicine Clinic and on the General Medicine Consult Service. Consultation Service is particularly concerned with medical evaluation of surgical patients. Limited enrollment.

499. General Medicine Research (1-18) I, II, III, IV. The Staff
Discussion—3 hours; clinical research—8-40 hours. Prerequisite: consent of instructor. The student will be involved in a clinical research problem within the areas, interest and expertise of members of Division of General Internal Medicine. Alternately, the research effort will be directed toward investigation of a clinical problem of general medical interest.

Internal Medicine—Hematology-Oncology

Upper Division Course

199. Research in Hematology–Oncology (1-5) I, II, III, IV. MacKenzie and staff
Laboratory—hours variable. Prerequisite: upper division standing and consent of instructor. Experience in laboratory research. (P/NP grading only.)

Graduate Courses

298. Topics in Hematology (1-4) I, II, III, IV. The Staff (Lewis in charge)
Prerequisite: one year of graduate work and/or consent of instructor. Basic concepts of the physiology of the hematopoietic organ, the pathophysiology of hematopoietic disease, and concepts of therapeutics will be offered for study. The specific topics to be dictated by the interest and background of the students.

299. Research (1-12) I, II, III, IV. The Staff (Lewis in charge)
Prerequisite: consent of instructor. Laboratory investigation contributing to the dissertation for a graduate degree. (S/U grading only.)

Professional Courses

460. Hematology-Oncology Clinical Clerkship (6-18) I, II, III, IV. J.P. Lewis and staff
Inpatient-outpatient clinical activity—40 hours. Prerequisite: Medical Sciences 431 and/or consent of instructor. Participation with members of the subspecialty service in the initial clinical evaluation, work-up, management and follow-up of patients with hematologic or oncologic disorders. May be repeated for credit. Limited enrollment.

462. Hematology-Oncology Clinical Clerkship (6-18) I, II, III, IV. Larkin and staff
Inpatient-outpatient clinical activity—40 hours. Prerequisite: Medical Sciences 431 and/or consent of instructor. Intensive clinical experience in hematology-oncology at Martinez VA Hospital, with emphasis on evaluating new patients, reading bone marrows, and administering chemotherapy. Weekly tutorial sessions with faculty and presentation of a comprehensive review of one topic. May be repeated for credit. Limited enrollment.

490. Practicum in Care for the Terminally Ill (6) I, II, III, IV. Watson-Williams
Discussion—3 hours; seminar—2 hours; hospice clinical activity—full time (4 weeks duration); written report. Prerequisite: fourth-year medical student and an interview with program Medical Director. UCD Medical Center Sacramento Continuing Care Program provides supportive services to patients with terminal illness. This elective provides experience in sympton relief, psycho-social care and bereavement counseling. Written report will be major component used in grading. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Lewis in charge)
Prerequisite: consent of instructor. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

Internal Medicine—Infectious Diseases

Upper Division Course

199. Infectious Diseases Research (1-5) I, II, III, IV. The Staff (Goldstein in charge)
Prerequisite: chemistry through organic chemistry (in addition, physical and biochemistry preferred), biology through basic bacteriology (in addition, microbiology and immunology preferred); and consent of instructor. Discrete problem requiring reading and actual manual effort in solution will be assigned to each student. Progress and results will be reviewed at intervals with instructor and via seminar presentation. (P/NP grading only.)

Graduate Course

250. Small Computers in Medical Research (3) I, Donovan
Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Theoretical principles and practical aspects of mini- and micro-computer applications in medical research.

Professional Courses

400. Infectious Diseases Clinic (2) I, II, III, IV. Goldstein and staff
Ambulatory patient care training. Prerequisite: Medical Sciences 431. Selected outpatients at Sacramento Medical Center with chronic respiratory or urinary tract infections will be worked up and followed. Limited enrollment. (May enroll for two consecutive quarters.)

460. Infectious Diseases Clinical Clerkship (3-18) I, II, III, IV. Goldstein
Discussion-seminar-laboratory. Prerequisite: completion of two-year study in accredited medical school in good standing. In addition to seeing patients ill with infectious diseases regarding whom consultation has been requested, students will have laboratory experience in clinical microbiology. Students will also attend and participate in infectious diseases conferences and rounds. Limited enrollment with priority to third-year medical students.

465. Infectious Diseases Clinical Clerkship (3-18) I, II, III, IV. Jordan
Clinical clerkship—full time (2 to 12 weeks). Prerequisite: successful completion of two years at accredited medical school; consent of instructor. In addition to seeing patients ill with infectious and immunologic diseases regarding whom consultation has been requested, students will have laboratory experience in clinical microbiology (Martinez VA Hospital). Attendance and participation in infectious diseases conferences and rounds. (S/U grading only.)

490. Seminar in Infectious and Immunologic Diseases (2) I, II, III, IV. Goldstein and staff
Seminar—2 hours; library research. Prerequisite: Medical Sciences 431. Epidemiology, diagnosis and management of the more important infectious and immunologic diseases will be considered. Wherever possible, actual inpatients (UCD Medical Center) will be used to demonstrate evaluation of individual cases. (S/U grading only.) Limited enrollment. (May enroll for two consecutive quarters.)

499. Research Topics in Infectious Disease (2-12) I, II, III, IV. The Staff (Goldstein in charge)
Prerequisite: successful completion of the first year of study in School of Medicine, graduate students,† and/or consent of instructor. Discrete problem requiring reading and actual manual effort in solution will be assigned to each student. Progress and results to be reviewed at intervals with instructor and via seminar presentation. (S/U grading only.)

Internal Medicine—Nephrology

Professional Courses

460. Nephrology and Fluid Balance (6-12) I, II, III, IV. Gulyassy and staff
Clinical activity—full time. Prerequisite: completion of third year of medical school; consent of instructor. Active participation in all clinical activities and conferences at UCD Medical Center and attendance at specific lectures covering the field of nephrology and fluid balance. Limited enrollment.

461. Nephrology, Fluid and Electrocytes (9-18) I, II, III, IV. Kaysen
Lecture—6 hours; discussion—10 hours; clinical activity—full time (6 to 12 weeks). Prerequisite: third- or fourth-year medical student with consent of instructor. Active participation in all clinical activities and conferences at the Martinez VA Hospital and to attend specific lectures covering the field of nephrology and fluid balance. Limited enrollment.

499. Research in Nephrology (6-18) I, II, III, IV. Gulyassy
Research—to be arranged; term paper. Prerequisite: consent of instructor. Independent laboratory research on a specific problem related to biochemical or immunologic causes of renal disease and/or uremic disorders in humans or animals. (S/U grading only.)

Internal Medicine—Nutrition

Graduate Course

290C. Clinical Nutrition Research Conference (1) I, II, III, IV. Halsted, Atkinson
Seminar—1 hour. Weekly seminar presented by a graduate student, taking the form of research completed or in progress, topic review or journal review from current journal. (S/U grading only.)

Professional Courses

461. Nutrition Clinical Clerkship (4 or 6) I, II, III, IV. Atkinson, Halsted, Wolfe and staff
Clinical activity—full time (6 or 12 weeks); patient evaluation and assessment—half time (1 week) at UCD Clinical Nutrition Center. Prerequisite: medical student with consent of instructor. In-depth experience in assessment and monitoring of nutritional support of adult patients at UCD Medical Center whose illnesses are complicated by malnutrition, and of patients attending the Nutrition Clinic with problems in undernutrition due to anorexia, gastrointestinal disease, overnutrition (obesity), or hyperlipidemia. Weekly seminars requiring literature review.

499. Research in Nutrition (9-18) I, II, III, IV. Halsted and staff
Prerequisite: medical student in good standing; consent of instructor. Participation in on-going clinical or basic nutrition research. Student may devise own project depending upon time commitments.

Internal Medicine—Pulmonary Medicine

Professional Courses

460. Pulmonary Clinical Clerkship (3-18) I, II, III, IV. Lillington
Clinical activity—full time. Prerequisite: Medical Sciences 431. Participation and rounds with Pulmonary Fellows and consultation staff at UCD Medical Center. Pulmonary function test interpretation, outpatient assignments in outpatient clinic and preparation and presentation of material at weekly conference. May be taken at another medical center by arrangement with instructor. Limited enrollment.

462. Pulmonary Clinical Clerkship (3-18) I, II, III, IV. Krumpe and staff
Clinical activity—full time. Prerequisite: completion of second year of medical school and/or consent of instructor. Participation at the Martinez VA Hospital with members of the subspecialty service in initial clinical evaluation work-up, management, and follow-up of patients with pulmonary disorders. Includes experience in Pulmonary Function Laboratory, Respiratory Care Unit, and pulmonary diagnostic processes. Limited enrollment.

464. Outpatient Program in Pulmonary Medicine (3 or 6) I, II, III, IV. Lillington and staff
Clinical activity—two 3-hour morning sessions. Prerequisite: completion of first year of medical school; consent of instructor. Attendance one morning at TB Clinic and one morning at Pulmonary Medicine Clinic at UCD Medical Center. Students will be responsible for initial work-up of individual patients and their presentation to attending staff.

490. Clinical Introduction to Respiratory Disease (3) II, III. Parsons and staff
Clinical activity—3 hours. Prerequisite: first quarter of Medical School. Emphasis on skills of physical diagnosis and use of other diagnostic procedures in respiratory diseases (at UCD Medical Center).

499. Research (1-12) I, II, III, IV. The Staff (Cross in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Internal Medicine—Rheumatology-Allergy

Lower Division Course

99. Directed Research in Immunology (1-5) I, II, III, IV. Gershwin
Laboratory—1-5 hours. Prerequisite: consent of instructor. Independent research will be encouraged in basic immunology, including the role of the cellular immune system in oncogenesis. (P/NP grading only.)

Upper Division Course

199. Directed Research in Immunology (1-5) I, II, III, IV. Gershwin
Laboratory—1-5 hours. Prerequisite: consent of instructor. Independent research will be encouraged in basic immunology, including the role of the cellular immune system in oncogenesis. (P/NP grading only.)

Graduate Courses

281. Clinical Immunology and Immunopathology (4) III. Gershwin, Robbins
Lecture—4 hours. Prerequisite: Medical Microbiology 107 or Veterinary Microbiology 270, or consent of instructor. Descriptive analysis of animal and human pathologic processes that interact with the immune system. Emphasis on infections, genetics, transplantation, allergy and autoimmunity. Offered in even-numbered years.

298. Topics in Rheumatology and Clinical Immunology (1-5) I, II, III, IV. Gershwin
Laboratory—1-5 hours. Prerequisite: consent of instructor. Library and/or laboratory work as required. (S/U grading only.)

299. Research in Autoimmune Disease (1-12) I, II, III, IV. Gershwin
Laboratory—1-12 hours. Prerequisite: consent of instructor. Independent research will be encouraged in both animal models of human disease (including congenitally athymic [nude], asplenic, and New Zealand mice) and the cellular immune system of patients with systemic lupus erythematosus, Sjögren's syndrome, polymyositis and drug hypersensitivity. (S/U grading only.)

Professional Courses

460. Rheumatology Clinical Clerkship (1-18) I, II, III, IV. Leek and staff
Inpatient-outpatient clinical activity—full time. Prerequisite: Medical Sciences 431 and consent of instructor. Participation with members of the subspecialty service in the diagnosis and therapeutic management of patients with rheumatologic diseases.

461. Allergy Clinical Clerkship (3-18) I, II, III, IV. Gershwin and staff
Inpatient-outpatient clinical activity—full time (2 to 12 weeks). Prerequisite: completion of second year of medical school and consent of instructor. Student will work with practicing allergist in daily work with patients and participate in weekly allergy clinic and teaching conferences. Study of the literature. Will see patients with problems in clinical immunology, immunodeficiency, asthma, allergic rhinitis.

499. Research (1-12) I, II, III, IV. The Staff (Gershwin in charge)
Prerequisite: medical student with consent of instructor. Part-time participation in active clinical and basic research projects which can involve both patient care and relevant laboratory procedures. Students can gain experience in clinical medicine and clinical investigation. (S/U grading only.)

Medical Microbiology

Lower Division Course

81. Preventive Health Care (2) II. Chang in charge, Rockwell; Jones (Student Health Center)
Lecture—2 hours; final examination. Students will learn preventive health care information that will enable them to live a healthier life. Emphasis will be placed on sexually transmitted diseases, mental health and drug abuse. (P/NP grading only.) (Same course as Family Practice 81.)

Upper Division Courses

107. Chemical and Cellular Immunology (4) II. Benjamini, Scibienski
Lecture—4 hours. Prerequisite: Biochemistry 101A, 101B or consent of instructor. Chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies and their interactions; molecular basis of antibody diversity; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity; immunogenetics and regulation of the immune response. (Same course as 407.)

115. Ecological Parasitology (2) II. Theis
Lecture—2 hours. Course will be devoted to the study of mankind's influence on environmental factors that affect the development and spread of parasitic agents.

130. Medical Mycology (2) III. Pappagianis
Lecture—2 hours. Prerequisite: course in pathogenic microbiology; consent of instructor. Various aspects of pathogenic fungi, particularly affecting humans, will be discussed including epidemiology, pathogenesis and pathology, diagnosis and therapy. (Same course as 430.)

192. Internship in Medical Microbiology (1-12) I, II, III, IV. The Staff (Pappagianis in charge)
Work-learn experience—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work-study experience in medical microbiology and related fields. (P/NP grading only.)

198. Group Study in Medical Microbiology (1-5) I, II, III, IV. The Staff (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.)

NOTE: For key to footnote symbols, see page 123.

Graduate Courses

209. Frontiers in Immunology (2) I, II, III. Benjamini, Scibienski
Discussion—2 hours. Prerequisite: consent of instructor. Current developments in various aspects of immunology and their interrelationships. (S/U grading only.) (Same course as 409.)

215. Medical Parasitology (5) I, Theis
Lecture—3 hours; laboratory—6 hours. Prerequisite: graduate students with consent of instructor. Epidemiological and laboratory studies of protozoa, helminths and arthropods of medical importance.

220. Current Concepts in Bacterial Ultrastructure (2) III. Beaman
Discussion—2 hours; student presentations; term paper. Prerequisite: Bacteriology 105 or consent of instructor. Critical evaluation of current literature dealing with all aspects of bacterial ultrastructure. Discussion of selected and assigned reading and formal student presentations of assigned topics.

298. Group Study in Medical Microbiology and Immunology (1-5) I, II, III, IV. The Staff (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: consent of instructor; open to graduate students.† Course deals with the clinical, epidemiological, and experimental aspects of viral diseases of man.

405. Immunologic Prophylaxis (2) II, Pappagianis
Lecture—2 hours. Prerequisite: consent of instructor.† The bases of immunization practices and immunoserologic diagnostic procedures particularly related to diseases of man. (S/U grading only.)

407. Chemical and Cellular Immunology (4) II. Benjamini, Scibienski
Lecture—4 hours. Prerequisite: medical student with consent of instructor. Chemical and cellular basis of immunity: structure-function relationship of antigens, antibodies and their interactions; molecular basis of antibody diversity; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity; immunogenetics and regulation of the immune response. (S/U grading only.) (Same course as 107.)

408. Topics in Clinical Immunology (2) II. The Staff (Benjamini in charge)
Lecture—1 hour; discussion—1 hour. Prerequisite: medical student status; at least one course in immunology or Medical Sciences 422 (immunology section). Selected topics in clinical immunology will include: immunodiagnosis, immunoprophylaxis, allergy, autoimmunity, transplantation and tumor immunology and immune deficiency diseases. Invited experts will cover topics.

409. Frontiers in Immunology (2) I, II, III. Benjamini
Discussion—2 hours; student reports. Prerequisite: medical students with consent of instructor. Current developments in various aspects of immunology and their interrelationships. (Same course as 209.)

411. Tissue Typing (1-4) I, II, III, IV. Chang
Individualized instruction, discussion—1-3 hours and laboratory—3-9 hours. Prerequisite: course in immunology; consent of instructor. Principle and technique of tissue typing through assigned reading and laboratory instruction. Contents will vary according to the needs of the students. (S/U grading only.)

415. Medical Parasitology (5) I, Theis
Lecture—3 hours; laboratory—6 hours. Prerequisite: medical student with consent of instructor. Epidemiological and laboratory studies of protozoa, helminths and arthropods of medical importance and evaluation of patients affected by them.

420. Current Concepts in Bacterial Ultrastructure (2) III. Beaman
Discussion—2 hours; formal presentation or term paper. Prerequisite: medical students with consent of instructor. Evaluation of current status of bacterial ultrastructure with an emphasis on host-parasite interactions through discussions and assigned readings. (S/U grading only.)

430. Medical Mycology (2) III. Pappagianis
Lecture—2 hours. Prerequisite: a course in pathogenic microbiology; consent of instructor. Various aspects of pathogenic fungi, particularly affecting humans, will be discussed including epidemiology, pathogenesis and pathology, diagnosis and therapy. (Same course as 130.)

480A. Basic and Medical Immunology (3) III. Benjamini and staff
Lecture—25 hours and laboratory—10 hours (35 hours total). Prerequisite: medical student with consent by Committee on Student Evaluation and Promotion. Biology of the immune response with emphasis on the immune response in humans. (Quarter III of Medical School curriculum.)

480B. Pathogenic Microbiology (7) I, Pappagianis and staff
Lecture—64 hours total; laboratory—28 hours total. Prerequisite: second-year medical students with consent by Committee on Student Evaluation and Promotion. Biology of pathogenic microorganisms with emphasis on their role in human disease.

498. Group Study in Medical Microbiology and Immunology (1-5) I, II, III, IV. The Staff (Pappagianis in charge)
Prerequisite: medical students with consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Pappagianis in charge)
Prerequisite: medical students with consent of instructor. (S/U grading only.)

Neurology

Lower Division Course

199. Individual Special Study and Research (1-4) I, II, III, IV. The Staff (Scobey in charge)
Prerequisite: consent of instructor. Individual special study in neurophysiology and biomedical engineering is offered to qualified students. Studies on psychophysics, single-unit electrophysiology and instrumentation are offered in Davis. (P/NP grading only.)

Graduate Courses

290. Seminar in Selected Topics (1) I, II, III, IV. Scobey
Seminar—1 hour. Prerequisite: consent of instructor. Selected topics in Neuroscience will be offered. (S/U grading only.)

298. Group Study (1-5) I, II, III, IV. The Staff (Dreyfus in charge)
Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. (S/U grading only.)

299. Individual Special Study and Research (1-12) I, II, III, IV. Scobey
Laboratory—3-36 hours. Prerequisite: consent of instructor. Individual special study and research in Neurophysiology and Biomedical engineering is offered at both Davis and Sacramento Medical Center. (S/U grading only.)

Professional Courses

420. Neuromuscular Pathophysiology (4) III. Gabor and staff
Lecture—34 hours and discussion—16 hours (50 hours total). Prerequisite: medical students with consent by Committee on Student Evaluation and Promotion. Lectures and case discussions of pathophysiology underlying neurological disorders including disorders of development, muscle, nerve, cerebral circulation, metabolism, myelin, cortical function, movement, cerebro-spinal fluid, autonomic function and special senses. Anatomical basis of clinical testing, nervous system infection, neoplasia and trauma. (Quarter VII of Medical School Curriculum.)

450. Clinical Neurology Clerkship (6) I, II, III, IV. Gabor and staff
Clinical activity—full time. Prerequisite: fourth-year medical student. Essentials of a detailed neurological examination and principles of differential neurological diagnosis. Emphasis on common neurological disorders encountered in practice.

451. Clinical Neurology Clerkship (6) I, II, III, IV. Remler and staff
Clinical activity—full time (4 weeks at Martinez VA Hospital). Prerequisite: fourth-year medical student. Essentials of detailed neurological examination and principles of differential neurological diagnosis. Emphasis on common neurological disorders encountered in practice.

452. Advanced Clinical Neurology (6) I, II, III, IV. Gabor and staff
Clinical activity—full time (4 weeks). Prerequisite: completion of four-week Neurology selective and consent of instructor. Extension of basic Neurology clerkship. Designed for students with special interest in medical disorders of nervous system. By arrangement with department, student may serve as an acting intern. Principles of neurological differential diagnosis and therapeutics emphasized.

453. Advanced Clinical Neurology (6) I, II, III, IV. Remler and staff
Clinical activity—full time (4 weeks at Martinez VA Hospital). Prerequisite: completion of four-week Neurology selective and consent of instructor. Extension of basic Neurology clerkship. Designed for students with special interest in medical disorders of nervous system. By arrangement with department, student may serve as an acting intern. Principles of neurological differential diagnosis and therapeutics emphasized.

454. Electroencephalography and Evoked Potentials (18) I, II, III, IV. Gabor, Seyal
Clinical activity—full time (12 weeks) technique and interpretation. Prerequisite: four-week Neurology clerkship and consent of instructor. Principles of electroencephalographic diagnosis including technical basis of electroencephalography and evoked potentials. Emphasis placed on how these studies are applied to neurological diagnosis.

455. Child Neurology (6) I, II, III, IV. Dreyfus
Clinical activity—full time (4 weeks). Prerequisite: four-week Neurology clerkship and/or consent of instructor. Student exposed to children with disorders of the nervous system, both in outpatient and inpatient services. Cases presented to a member of full time faculty who will discuss clinical findings, differential diagnosis, management and therapy. Student encouraged to read pertinent literature.

456. Cortical Neurology (18) I, II, III, IV. Remler, Friedland, Knight
Clinical neurological research—full time (12 weeks at Martinez VA Hospital). Prerequisite: course 451 or the equivalent; consent of instructor. Student will pursue small project in clinical neurologic research on higher cortical functions. Focus on scientific analysis of behavior in disease states.

457. Special Topics in Neurology (18) I, II, III, IV. The Staff
Clinical activity—full time (12 weeks). Prerequisite: fourth-year medical student having completed four-week Neurology clerkship, or consent of instructor. Students study areas of special interest in tutorial manner under supervision of member of faculty with expertise and interest in elected field. Students may elect tutorial clinical emperience with member of staff.

458. Cognitive and Communication Disorders: Introduction to Cognitive and Communication Disorders (3) I, Wertz
Lecture—3 hours; observations, individual projects. Prerequisite: consent of instructor. Introduction to cognitive and communication disorders. Includes a survey of disorders subsequent to brain damage; management by neurology, neuropsychology, and speech pathology; and current research on appraisal, diagnosis, and treatment. Offered in the Martinez VA Medical Center. (S/U grading only.)

459. Cognitive and Communication Disorders: Independent Study in Neurogenic Communication Disorders (1-3) I, II, III, IV. Wertz
Conference, observation and data collection—3-9 hours. Prerequisite: consent of instructor. Independent study of neurogenic communication disorders—aphasia, dementia, apraxia of speech, dysarthria. Designed for individual interest and includes discussion, directed reading, research design, data collection, and preparation of results. Offered in the Martinez VA Medical Center. (S/U grading only.)

464. Clinical Neurology (3-18) IV, I, II, III. The Staff (Gabor in charge)
Clinical activity—full time (minimum of one-half quarter). Prerequisite: fourth-year medical student or third-year medical student with completion of a medical clerkship; consent of Chairperson. Clerkship in neurology to be arranged at another institution with accredited residency programs in neurology under proper supervision.

468. Special Clinical Elective in Neurology (9) IV, I, II, III. Dreyfus, Gabor, Seyal, Palma
Clinical activity—full time (4 to 12 weeks). Prerequisite: fourth-year medical students and third-year medical students with clerkship in medicine and pediatrics (from outside medical schools). Student will function as acting intern on neurology service. Emphasis will be on mastering neurologic examination and on introduction to neurologic evaluation, diagnosis and therapy.

***470. Elective in Pediatric Neurology** (3)
Clinical activity—one-third time. Prerequisite: third- or fourth-year medical student. Inpatient and outpatient experience in diagnosis and management of neurological disorders in children. This elective may be combined with course 499 or other electives which do not conflict with principal scheduled activities. Limited enrollment. (Same course as Pediatrics 470.)

499. Research (1-12) I, II, III, IV. The Staff (Gabor in charge)
Laboratory—2-24 hours. Prerequisite: consent of instructor.† Laboratory investigation on selected topics. (S/U grading only for graduate students.)

Neurosurgery

Upper Division Course

199. Neurosurgical Research (1-5) I, II, III, IV. Chehrazi, Corkill, Wagner, Youmans
Prerequisite: advanced undergraduate standing with consent of instructor. Exposure to current neurosurgical research which includes N.M.R. analysis of high energy phosphate changes in stroke and related pharmacology in the gerbil.

NOTE: For key to footnote symbols, see page 123.

audioradiography, image analysis, vascular impedance and oxygen hyperbaricity. These activities, and individual projects are topics of regular student/faculty meetings. (P/NP grading only.)

Graduate Course

286. Diseases of the Nervous System (3) I, II, III, IV. The Staff (Wagner 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 Courses

460. Clinical Neurosurgery (6-18) I, II, III, IV. Chehrazi, Corkill, Wagner, Youmans
Clinical activity—full time (3 days per unit; 4 weeks minimum). Prerequisite: third- and fourth-year medical students; consent of instructor. Admission and follow-up of eight patients. Neurological history, examination and further diagnostic procedures emphasized. Students participate in meaningful aspects of surgical procedures and attend listed conferences, rounds, and seminars.

461. Scientific Basis for the Surgical Treatment of Neurological Disease (6-18) I, II, III, IV. Chehrazi, Corkill, Wagner, Youmans
Clinical activity—full time (3 days per unit; 4 weeks minimum). Prerequisite: third- and fourth-year medical students; consent of instructor. Basic science and practical aspects of care of patients with neurological diseases will be covered through series of lectures, conferences, rounds, attendance at operations and participation in care of patients.

465. Surgical Team Participation: Martinez VA Medical Center (6–12) I, II, III, IV. St. John
Clinical clerkship—full time (4 to 8 weeks). Prerequisite: third- or fourth-year medical student; completion of Medical Sciences 430. Participation in evaluation, medical management and surgical treatment of patients with neurosurgical conditons; intracranial, spinal and peripheral nerve disorders, on ward and in clinics. Emphasis on neurological examinations and interpretation of diagnostic examinations. Attendance at educational conferences on this subject.

499. Research (1-12) I, II, III, IV. Wagner and staff
Prerequisite: medical student with consent of instructor. (S/U grading only.)

Obstetrics and Gynecology

Professional Courses

***401. Discussions in Obstetrics and Gynecology** (2) I, II, III, IV. Hanson and staff
Discussion—2 hours. Prerequisite: second-year medical students; consent of instructor. Obstetrics and gynecology history taking and examination, an overview of the physiology and pathology of the female reproductive tract, and a consideration of the reaction of the female to pelvic disease and to her sexual identity.

420. Reproductive System and Perinatology (2) I. Wennberg
Lecture—20 hours total; discussion—2 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Normal structure and function of reproductive system are presented. Abnormalities in perinatology are approached by study of appropriate clinical problems. (Same course as Pediatrics 420.)

***460. Elective Clerkship** (4-18) I, II, III, IV. Niswander and staff
Clinical activity—full time (3 days per unit). Prerequisite: third- and fourth-year medical students; Medical Sciences 432A; consent of instructor. Active participation in inpatient and outpatient care at San Joaquin General Hospital. Attendance at specified conferences; student-faculty member informal conferences. May be repeated for credit.

***462. Elective Clerkship** (4-18) I, II, III, IV. Niswander
Clinical activity—full time (3 days per unit). Prerequisite: third- or fourth-year medical students; Medical Sciences 432A; consent of instructor. Student will participate actively in outpatient care at Planned Parenthood Association, Sacramento. Attendance at specified conferences; student-faculty member informal conferences. May be repeated for credit.

***464. Obstetrics and Gynecology Clerkship** (4-18) I, II, III, IV. Niswander
Clinical activity—full time (3 days per unit). Prerequisite: third- and fourth-year medical students; Medical Sciences 432A; consent of instructor. Active participation in inpatient and outpatient care at Woodland Memorial Hospital. Attendance at specified conferences; student-faculty member informal conferences. May be repeated for credit.

465. Elective Clerkship (4-18) I, II, III, IV. Niswander and staff
Clinical activity—full time (3 days per unit). Prerequisite: third- and fourth-year medical student; Medical Sciences 432A (or the equivalent); consent of instructor. Active participation in inpatient and outpatient care. Attendance at specified conferences; student-faculty member informal conferences. May be repeated for credit.

466. Obstetrics: Adolescent Pregnancy (4-18) I, II, III, IV. Meyers
Seminar; clinical activity—individually arranged. Prerequisite: two years of medical school; consent of instructor. Direct clinical contact with at least two adolescent pregnancies provided over ten-week period. Emphasis on obstetrical and psychological clinical issues of pregnancy, delivery, the puerperium and neonatal interaction. Relevant literature will be reviewed.

468. Primary Care at a Community Women's Clinic (1-3) I, II, III, IV. Hanson
Lecture training—weekend; clinical activity—full time, to alternate with discussion sessions. Prerequisite: third- and fourth-year medical students with full-time enrollment; consent of instructor. Provides student with exposure to episodic and comprehensive family planning and gynecological care in a community setting, emphasizing continuity of care. Experience in diagnosis, treatment, counseling of patients and office and laboratory procedures. Limited enrollment. (S/U grading only.)

469. Perinatal Medicine Clerkship (4-18) I, II, III, IV. Haesslein, Hanson
Prerequisite: fourth-year medical students; consent of instructor. Management of consultation for such problems as toxemia, diabetes, hypertension, cardiac disease, premature labor, etc., and all types of intrapartum problems, as well as exposure to ultrasonography, amniocentesis and genetic counselling.

499. Research in Obstetrics and Gynecology (4-18) I, II, III, IV. Trelford and staff
Prerequisite: medical student with consent of instructor. Student will pursue a research problem of her/his own choosing, selected with help of the faculty. Integration with ongoing faculty research projects recommended. (S/U grading only.)

Ophthalmology

Professional Courses

440. Ophthalmology Required Clerkship (3) I, II, III, IV. Mannis
Clinical clerkship—full time (2 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Fundamental knowledge of ophthalmic diagnosis and principles; basic ophthalmic instruments; understanding of treatment for eye problems manageable by a primary care physician; knowledge of what patients should be referred for ophthalmic care.

461. Basic Clinical Ophthalmology (4.5) I, II, III, IV. Roth
Clinical activity—to be arranged (3 weeks). Prerequisite: medical students who have completed either Medical Sciences 430 or Ophthalmology 440 (in third or fourth year); consent of instructor. Provides an acquaintance with the fundamentals of routine clinical ophthalmology.

465. Advanced Subspecialty Ophthalmology (6 or 9) I, II, III, IV. Mannis, Keltner
Clinical activity—to be arranged (4 weeks off campus or 6 weeks at UCD Medical Center). Prerequisite: medical students who have completed either Medical Sciences 430 or Ophthalmology 440 (in third or fourth year); consent of instructor. Participation in disciplines of neuro-ophthalmology/pediatric ophthalmology, diseases of the cornea and external eye, glaucoma and retina. Rotations at UCD Medical Center may be arranged in 6-week units of one service alone, or in combination, as arranged with instructors.

498. Group Study (1-3) I, II, III, IV. The Staff (Roth in charge)
Prerequisite: medical students with consent of instructor. Directed reading and discussion. (S/U grading only.)

499. Research in Ophthalmology (1-12) I, II, III, IV. Mannis, Keltner, Roth, Johnson
To be arranged—3-36 hours. Prerequisite: medical students with consent of instructor. Individual research on selected topics in optics and visual physiology or in cornea and external disease. (S/U grading only.)

Orthopaedic Surgery

Lower Division Course

***99. Special Studies for Undergraduates** (1-4) I, II, III, IV. The Staff
Prerequisite: lower division standing; basic chemistry; consent of instructor. Laboratory research on selected topics related to orthopaedics including fracture healing and fracture fixation, biomaterials used in orthopaedics, and biological responses to biomaterials including allergy and infection. (P/NP grading only.)

Upper Division Course

***199. Special Studies for Advanced Undergraduates** (1-5) I, II, III, IV. The Staff
Prerequisite: upper division standing; basic chemistry; consent of instructor. Laboratory research on selected topics related to orthopaedics including fracture healing and fracture fixation, biomaterials used in orthopaedics, and biological responses to biomaterials including allergy and infection. (P/NP grading only.)

Professional Courses

401A. Sports Medicine: Medical Aspects of Sports Injuries (2) I, Chapman, Fowler (Physical Medicine and Rehabilitation) in charge
Lecture—2 hours. Prerequisite: completion of Core A for medical students; upper division course in systemic physiology and anatomy for graduate students.† A multidisciplinary course introducing the student to patho physiology of sports injuries, physical examination of the injured athlete, and management of sports injuries. Specific injuries, taping, and use of physical modalities will be discussed. (S/U grading only for graduate students.) (Same course as Physical Medicine and Rehabilitation 201A, 401A, Physical Education 201A.)

410. Basic Sciences of Orthopaedics (2) I, II. Bargar
Lecture—1 hour; laboratory—1 hour. Prerequisite: medical student: Medical Sciences 410, 411A; consent of instructor. Embryology, histology, and general pathology as related to the practice of orthopaedic surgery. Laboratory preparation.

***421. Skeletal System** (2.5)
Lecture—20 hours total; discussion—12 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Provides a basic science understanding of normal and abnormal skeletal and joint development, physiology, and pathology. Clinical correlates are provided only as a supplement to emphasize cause and effect phenomena as it relates to bone and joint disease. (Quarter VII of Medical School curriculum.)

426. Initial Management of Musculoskeletal Trauma (4) I, II, III, IV. The Staff (Chapman in charge)
Laboratory—8 hours. Prerequisite: medical student; human anatomy; consent of instructor. Opportunity to observe and assist in emergency and operating rooms in management of orthopaedic problems of trauma. Under house staff supervision, students rotate through Emergency Room at UCD Medical Center. Includes management of acute minor injuries. Limited enrollment.

***427. Clinical and Surgical Orthopaedics** (6) I, II, III, IV. Chapman
Clinical clerkship—full time (4 weeks). Prerequisite: restricted to students taking the Advanced Surgery Clerkship requirement in the fourth-year curriculum. Student will work in the clinic seeing patients and doing work-ups, scrub in the operating room as assistant, and rotate to the Veterans Administration Clinic. Includes lectures twice weekly with assigned faculty.

428. Office and Ambulatory Orthopaedics (6-18) I, II, III, IV. The Staff (Chapman in charge)
Clinical activity—full time. Prerequisite: third- or fourth-year medical student; consent of instructor. Introduction to general orthopaedic problems and their management on an outpatient basis. Class members will conduct orthopaedic examinations, present patients to staff, and lead a discussion of treatment regimens. Emphasis will be placed on orthopaedic physical examination and interpretation of x-rays.

***429. Clinical Studies in Scoliosis** (1-2) I, II, III, IV. Benson
Clinical activity—half or full quarter. Prerequisite: fourth-year medical student; consent of instructor. Diagnosis and treatment of scoliosis and other spinal afflictions. Covers spinal surgical procedures. Monthly clinics at Kaiser; and weekly clinics at UCD Medical Centers. Monthly spine conference where student will present short paper on selected topic.

462. Community Preceptorship (6-18) I, II, III, IV. The Clinical Staff (Chapman in charge)
Clinical activity—full time. Prerequisite: third- or fourth-year medical student; Medical Sciences 430; consent of instructor. Designed to acquaint student with private practice of orthopaedic surgery in community setting. Opportunity to observe and assist private practitioners in office, emergency room, and hospital. (Student provides own transportation.)

463. Advanced Orthopaedics: Surgical Team Participation Martinez VA Medical Center (6-12) I, II, III, IV. Lagerquist, Guernsey
Clinical clerkship—full time (4 to 8 weeks). Prerequisite: third- or fourth-year medical student; Medical Sciences 430; three-week orthopaedic rotation during surgical clerkship as third-year medical student. Basic orthopaedic evaluation of patients on a one to one basis in the Orthopaedics Clinic and on the ward. Follow inpatients through work-up, surgery and post-operative period. Patient care involves primarily

NOTE: For key to footnote symbols, see page 123.

reconstruction, amputation and hand surgery. Acute trauma is limited to geriatric fractures. Limited enrollment.

464. Advanced Orthopaedics. (6-18) I, II, III, IV. The Staff (Chapman in charge)
Clinical activity—full time. Prerequisite: third- or fourth-year medical students; Medical Sciences 430; consent of instructor. Aims are to increase student's basic knowledge of musculoskeletal abnormalities at the clinical level. Attention will be focused on selective case material. For those students who demonstrate proficiency, responsibility will be similar to that of an intern. Limited enrollment by rotation.

465. General Principles of Orthopaedic Surgery (1) I, II, III, IV. Staff (Chapman in charge)
Lecture—1 hour; discussion—1 hour (5 weeks). Prerequisite: medical student with consent of instructor; Medical Sciences 410, 411A. Weekly grand rounds conference dealing with clinical problems being currently treated in hospital. Current concepts of treatment and experience of UCD Medical Center with particular problem will be discussed by Orthopaedic staff. Limited enrollment.

499. Orthopaedic Surgery (1-12) I, II, III, IV. The Staff
Prerequisite: medical student and consent of instructor. Laboratory or clinical investigation on selected topics. (S/U grading only.)

Otorhinolaryngology

Lower Division Course

192. Internship in Otorhinolaryngology (1-12) I, II, III, IV. Chole in charge
Project study—3 to 36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-learn experience in otorhinolaryngology and related fields. Final project report. (P/NP grading only.)

199. Special Study in Otorhinolaryngology for Advanced Undergraduates (1-5) I, II, III, IV. Chole
Prerequisite: advanced undergraduate with consent of instructor. Independent research studies on various subspecialties of otorhinolaryngology under the direction of a faculty member. (P/NP grading only.)

Graduate Course

299. Special Study in Otorhinolaryngology for Advanced Graduates (1-12) I, II, III, IV. Chole and staff
Prerequistie: advanced graduate student with consent of instructor. Independent research studies on the various subspecialties of Otorhinolaryngology under the direction of a faculty member. (S/U grading only.)

Professional Courses

400. Suture Techniques (1) I, II, III, IV. Bernstein
Lecture—5 hours total; laboratory—10 hours total. Prerequisite: second- and fourth-year medical students with consent of instructor; open to graduate† and veterinary medical students. Principles of management of lacerations and the various techniques of suturing a wound.

401. Clinical Examinations in Otorhinolaryngology (1) I, II, III, IV. Chole
Lecture—1 hour; laboratory—1 hour; practical—1 hour total. Prerequisite: second-year medical students with consent of instructor; open to graduate students.† Obtaining the history, applied anatomy of the regions, and the art of the examination. Head mirror required.

402. Otorhinolaryngology in Family Practice (1) I, II, III, IV.
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.

403. Basic Principles of Reconstructive Surgery (1) II. Donald
Lecture—four 2-hour sessions; laboratory—one 2-hour session (5 weeks). Prerequisite: third- or fourth-year medical student with consent of instructor. Formal presentations covering basic principles of reconstructive surgery, including wound healing, treatment of lacerations, skin and bone grafts, flaps, Z-plasties and revision of scars. Laboratory devoted to utilizing animal tissues.

440. Otorhinolaryngology Required Clerkship (3) I, II, III, IV.
Clinical clerkship—full time (2 weeks). Prerequistie: consent by Committee on Student Evaluation and Promotion. Provides fundamental knowledge of otorhinolaryngologic diagnosis and principles, develops facility with basic ENT instruments, provides an understanding of treatment for ear, nose and throat problems manageable by a primary care physician, provides knowledge of what patients should be referred for otorhinolaryngologic care.

460. Clinical Otorhinolaryngology Elective (3-18) I, II, III, IV.
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.

465. Surgical Team Participation: Martinez VA Medical Center (6-12) I, II, III, IV. Lasky
Clinical clerkship—full time (4 to 8 weeks). Prerequisite: third- or fourth-year medical student; Medical Sciences 430. Student will work with Ear, Nose and Throat resident involved with inpatient care and clinics in treatment of head and neck tumors. Surgical oncology involving radiotherapy and surgical reconstruction after ablative cancer surgery is stressed. Supervision and training by attending staff. (S/U grading only.)

490. Journal Seminar (1) I, II, III, IV. Donald, Chole
Lecture-discussion—10 hours total (course given three times per quarter). Prerequisite: fourth-year medical students with consent of instructor; open to graduate students.† Monthly review of current otorhinolaryngologic and related literature and recent advances.

499. Research (1-12) I, II, III, IV. Donald
Prerequisite: medical students with consent of instructor; open to graduate students.† Participation in ongoing projects.

Pathology

Upper Division Courses

192. Internship in Human Pathology (1-12) I, II, III, IV. The Staff
Work-learn exerience—3-36 hours; final project report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-study experience in pathology and related fields. (P/NP grading only.)

199. Special Study in Pathology for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: advanced undergraduate, and consent of instructor. Independent research studies on the pathogenesis of disease under the direction of a faculty member. (P/NP grading only.)

Graduate Courses

202. Current Topics in Tumor Biology (2) I, II, III, IV. Cardiff
Seminar—2 hours. Prerequisite: consent of instructor. Discussion of current topics in tumor biology by invited speakers and members of the class. A forum for presentation of proposed and completed experiments by persons interested in tumor biology.

207. Introduction to Nervous System Pathology (1-4) I, II, III, IV. Ellis
Seminar—1-4 hours. Prerequisite: consent of instructor; open to advanced undergraduate, graduate, veterinary medical, and medical students. Study of nervous system tissue responses to injury, infection, neoplasia, and malformation in both the human and experimental animal. Seminars include correlation of clinical, gross and microscopic findings. Discussions provide instruction in microscopic techniques.

208. Drug and Chemical Toxicology (2) III. Baselt
Lecture—2 hours. Prerequisite: a course in medical pharmacology; open to third- and fourth-year medical students, residents, and graduate students. Presents the chemistry, occurrence, common means of exposure, toxicity, treatment, and laboratory analysis of the drugs and chemicals most frequently involved in human poisoning. (S/U grading only.)

210. Introduction to Human Pathology (5) I, A. Lewis
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: graduate or upper division students with background in gross and microscopic anatomy, physiology and biochemistry. Study of the processes, causes and effects of disease, including inflammation, neoplasia, immunology, parasitism, degeneration, abnormalities of growth, and injuries due to environmental and toxic agents. Course not intended for veterinary medical or medical students.

298. Advanced Group Study (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor. Group study in a variety of advanced topics in general and special pathology. (S/U grading only for medical students; letter grading for graduate students.)

299. Research (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. Research in the mechanisms of disease, the effects and causes of injury, neoplasia, neuropathology and comparative pathology. (S/U grading only.)

Professional Courses

***404. Forensic Pathology** (2) III
Lecture—1 hour; laboratory—3 hours. Prerequisite: medical student or consent of instructor. Systematic study of current forensic cases with emphasis on differential diagnosis, preservation of evidence, and medical-legal procedures. Introduction to histopathologic diagnosis, ballistics, and toxicology. Limited enrollment.

***405. Brain-Cutting Conference** (1-2) I, II, III, IV. Ellis
Prerequisite: third- and fourth-year medical students or consent of instructor. Current specimens are sectioned, discussed, and clinical correlations proposed.

***407. Diseases of the Nervous System** (1-3) I, II, III, IV. Ellis
Lecture—1 hour; discussion—1 hour; seminar—1 hour. Prerequisite: third- and fourth-year medical students or special training in pathology or neurological sciences; consent of instructor. Study of human nervous system reactions to disease including infection, neoplasia and maldevelopment; application of experimental models to human disease; and clinical correlations. Seminars emphasize microscopic findings in current cases; discussions include individualized experience in neuropathologic techniques. Given jointly with the Departments of Neurology and Neurosurgery.

***408. Autopsy Case Studies** (1-12) I, II, III, IV. Ruebner
Discussion—1-4 hours; laboratory—3-24 hours. Prerequisite: medical student or consent of instructor. Participation and/or performance, under supervision, of complete autopsies with correlative discussion of clinical material, gross, microscopic and laboratory findings.

***409. Neuropathology Conference** (1) I, II, III, IV. Ellis
Seminar—1 hour. Prerequisite: medical students or consent of instructor; open for credit to graduate students.† Neuropathologic findings in current cases are correlated with clinical findings and compared with previously reported cases. Given jointly with Departments of Neurology and Neurosurgery.

410. Introduction to Alcoholism (1.5) I, II, III, IV. Wellings
Lecture—2 hours, discussion—4 hours, and clinical experience 30 hours (36 hours total; 1 week). Prerequisite: third- or fourth-year medical student with consent of instructor. Provides an introduction to pathology, diagnosis, and treatment of alcoholism through lectures, discussion groups and direct clinical experience at local facilities. Limited enrollment.

411. General Pathology (3) III. A. Lewis
Lecture—27 hours, discussion—2 hours, and laboratory—11 hours (40 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Introduction to principles governing processes of human disease which cross organ system boundaries. Methods applicable to gross and microscopic examination of disease. Required for first-year medical students. (Quarter III of Medical School curriculum.)

423. Systemic Pathology (8.5) IV. Cardiff
Lecture—57 hours total; laboratory—90 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Important and common diseases of human organ systems. Pathophysiologic basis of disease in the clinical setting. (Quarter IV of Medical School curriculum.)

424. Laborstory Medicine (2) III. Miller
Lecture—13 hours, discussion—1 hour, and laboratory—11 hours (25 hours total). Prerequisite: medical student with approval by Committee on Student Evaluation and Promotion. Course provides a fundamental knowledge of the role and application of modern clinical laboratory medicine. Emphasis upon optimization of selection of laboratory measurements, decision analysis, interpretation of laboratory results, solving of selected problems using laboratory measurement. (Quarter III of Medical School curriculum.)

***430A-430T. Pathology Specialty Training** (1-18) IV, I, II, III. Wellings and staff
Prerequisite: pathology intern or pathology resident; consent of instructor. Detailed presentation of anatomical and clinical pathology with emphasis on clinico-pathological correlation, and use of pathological methods in diagnosis and therapeutics. Intended to prepare student for specialty practice in pathology, or for academic pathology. (S/U grading only.)

460. Advanced Applied Anatomical Pathology (9) I, II, III, IV. Gardner
Clinical clerkship—6 weeks full-time. Prerequisite: third- or fourth-year medical students or consent of instructor. Students interact with faculty and residents and perform complete autopsies under supervision. Students report findings and conclusions in general and specialty conferences.

***461. Advanced Applied Clinical Pathology** (6) II. A. Lewis
Lecture—5 hours; discussion—5 hours (6 weeks). Prerequisite: third- or fourth-year medical students. Formal and informal sessions devoted to strategy of ordering and interpreting laboratory examinations. Didactic lectures, review pathophysiologic relationships of laboratory findings to underlying disease processes and demonstrate applications in analysis of recent cases. (S/U grading only.)

464. Clerkship in Advanced Applied Surgical Pathology (9) I, II, III, IV. Tesluk
Clinical Clerkship—full time (6 weeks). Prerequisite: third- or fourth-year medical students; course 460 or consent of instructor. Designed to provide students with an intensive experience in surgical pathology. Participation in grossing of specimens, preparation of frozen sections and slide reading sessions as well. Students attend surgical pathology conferences and seminar sessions in which clinical correlation and diagnostic information is discussed. Limited enrollment. (S/U grading can be in effect.)

NOTE: For key to footnote symbols, see page 123.

465. Applied Clinical Laboratory Immunology (9) II, III. Miller
Clinical Clerkship—full time (6 weeks). Prerequisite: third- or fourth-year medical students: course 461 or consent of instructor. Designed to provide students with an intensive clerkship experience in applied clinical laboratory immunology. Emphasis upon laboratory techniques, procedures and interpretation of laboratory results. Students will be expected to participate fully and in all laboratory operations including bench techniques, laboratory management and quality control. Limited enrollment. (S/U grading can be in effect.)

466. Medical Jurisprudence (2) III. Reed
Lecture—1 hour; discussion—1 hour. Prerequisite: upper division or medical student standing. Explanation of the American legal and judicial system as it applies to the practice of medicine and physician-patient relationship. (S/U grading only.)

498. Advanced Group Study (1-5) I, II, III, IV. The Staff
Prerequisite: medical student and consent of instructor. Group study in variety of advanced topics in general, special, experimental, or comparative pathology. (S/U grading only can be in effect.)

499. Research (1-18) I, II, III, IV. The Staff
Prerequisite: medical student with consent of instructor. Research in experimental, molecular, comparative, and applied pathology. Limited enrollment. (S/U grading only can be in effect.)

Pediatrics

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: undergraduate student with consent of instructor based upon adequate preparation as determined by instructor. Opportunity to participate in research projects of the supervising instructor. Approaches to experimental design and specific problem solving. Opportunity to learn a variety of laboratory techniques appropriate to the specific research endeavor. (P/NP grading only.)

Graduate Course

299. Pediatric Research (1-12) I, II, III, IV. The Staff (Miller in charge)
Prerequisite: graduate students who are candidates for a degree in some area of biology or behavioral sciences; consent of instructor. Research will generally involve some aspect of growth and development. (S/U grading only.)

Professional Courses

401. Preceptorship in Pediatrics (2) I, II, III, IV. Miller
Preceptorship—half time. Prerequisite: second-year medical student or first-year medical student with consent of instructor. Opportunity to observe and participate in primary medical care in a practicing pediatrician's office. Participation in history-taking and physical examination will be at discretion of preceptor and dependent on student's experience. Evaluation by student.

402. Clinical Experience in Private Practice (1-18) I, II, III, IV. Miller
Clinical activity—full time (4 to 12 weeks). Prerequisite: third- or fourth-year medical student; Medical Sciences 432B; consent of preceptor and Chairperson. Opportunity to participate in practice of preceptor performing such tasks as history taking, physical examination, and patient management. (S/U grading only.)

420. Reproductive System and Perinatology (2) I. Wennberg, Niswander
Lecture—20 hours total; discussion—2 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Normal structure and function of reproductive system are presented. Abnormalities in perinatology are approached by study of appropriate clinical problems. (Same course as Obstetrics and Gynecology 420.) (Quarter VI of Medical School curriculum.)

460A. Inpatient General Pediatrics Clerkship Elective (1-18) I, II, III, IV. Smithwick
Clinical activity—full time (4 to 10 weeks). Prerequisite: third- or fourth-year medical students; Medical Sciences 432B; consent of instructor. Supervised experience in pediatric care on inpatient service at UCD Medical Center. Students function as interns with appropriate supervision by residents and attending faculty. Patients worked up by one student will not be worked up by other students or interns. (No monetary compensation.) Limited enrollment.

460B. Outpatient General Pediatrics Clerkship (1-18) I, II, III, IV. Beauchamp
Clinical experience—full time (4 to 10 weeks). Prerequisite: third- or fourth-year medical student; Medical Sciences 432B; consent of instructor. Supervised experience in pediatric care on outpatient service at UCD Medical Center. Students function as interns with appropriate supervision by residents and attending faculty. Patients worked up by one student will not be worked up by other students or interns. (No monetary compensation.) Limited enrollment.

461. Elective in Pediatric Hematology (1-18) I, II, III, IV. Abilgaard
Clinical experience—full time (3 days per unit). Prerequisite: second-year medical student or the equivalent; consent of instructor. Inpatient and outpatient experience in diagnosis and management of hematologic disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

462. Elective in Pediatric Endocrinology (1-18) I, II, III, IV. Connors
Clinical experience—full time (3 days per unit). Prerequisite: second-year medical student or the equivalent; consent of instructor. Inpatient and outpatient experience in diagnosis and management of endocrine disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

464. Elective in Neonatology (1-18) I, II, III, IV. Goetzman
Clinical experience—full time (3 days per unit). Prerequisite: third- or fourth-year medical student. Designed to offer a wide experience in diagnostic and therapeutic aspect of the medical and surgical high risk neonate. Limited enrollment.

465. Pediatric Specialty Clinics (1-18) I, II, III, IV. Beauchamp, Reinhart
Clinical experience—full time (3 days per unit). Prerequisite: third- or fourth-year medical student; courses 460A, 460B; consent of instructor. Supervised experience in a variety of pediatric subspecialty clinics including allergy, cardiology, endocrinology, hematology, neonatology, neurology, etc., and an option to spend one-half day per week with a local pediatrician. No examination.

466. Elective in Pediatric Cardiology (1-18) I, II, III, IV. Greenwood
Clinical activity—full time (3 days per unit). Prerequisite: second-year medical student or the equivalent; consent of instructor. Inpatient and outpatient experience in diagnosis and management of cardiac disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

467. Elective in Pediatric Pulmonology (1-18) I, II, III, IV. Kurland
Clinical activity—full time (9 units per half quarter). Prerequisite: students enrolled in School of Medicine; successful completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of pulmonary disorders in children. Limited enrollment.

468. Elective in Pediatric Nephrology (1-18) I, II, III, IV. Adelman
Clinical activity—full time (9 units per half quarter). Prerequisite: students enrolled in School of Medicine; successful completion of Medical Sciences 432B or a medicine core clerkship; consent of instructor. Inpatient and outpatient experience in diagnosis and management of renal disorders in children. Laboratory experience and participation in clinical investigation may be arranged No examination.

469. Elective in Pediatric Infectious Diseases (1-18) I, II, III, IV. Halsted
Clinical activity—full time (3 days per unit). Prerequisite: second-year medical student; Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and treatment of infectious diseases of infants and children. Laboratory and clinical investigation may be arranged. No examination. Limited enrollment.

***470. Elective in Pediatric Neurology** (3) I, II, III, IV.
Clinical activity—one-third time. Prerequisite: third- or fourth-year medical student. Inpatient and outpatient experience in diagnosis and management of neurological disorders in children. This elective may be combined with course 465, 499 or other electives which do not conflict with principal scheduled activities. Limited enrollment (Same course as Neurology 470.)

471. Elective in Pediatric Gastroenterology (1-18) I, II, III, IV. Cox
Clinical experience—full time (3 days per unit). Prerequisite: Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of gastroenterologic disorders in children. Laboratory experience and participation in clinical investigation may be arranged. No examination. Limited enrollment.

472. Pediatric Diabetes and Endocrine (6-9) IV. Sheikholislam
Lecture—2 hours; discussion—4 hours; laboratory—1 hour; informal discussion. Prerequisite: fourth-year student in Medical School. Students stay at three-week camp for diabetic children. For ten days prior to camp lectures will be held on juvenile onset diabetes, accidents, etc. Students review progress of campers and present this to faculty for discussion.

473. The Role of the Pediatrician in Primary Prevention in Community Health (4) II, III. Eichhorn
Lecture—1 hour; seminar—1 hour; laboratory—6 hours. Prerequisite: UCD medical students and graduate students† with consent of instructor. Student will study and be involved in a clinical experience concerning the developmental process of the child and its family from pregnancy through first three years of life, and role of the pediatrician in primary prevention in community health.

474. Introduction to Human and Medical Genetics (2) I, II, III, IV. Centerwall
Lecture—2 hours. Prerequisite: first- and second-year medical students. Fundamentals of inheritance, environment vs. heredity, case examples as models for genetic concepts in biochemical, population, cyto- and clinical genetics—to better understand the role of heredity throughout the various disciplines of medicine and the application of human genetics to medical practice. (S/U grading only.)

475. History of Pediatrics (2) I, II, III, IV. Greenwood
Lecture—2 hours. Prerequisite: first-year medical student and consent of instructor. Survey of development of pediatrics.

***490. Clinical Pediatrics** (1-18)
Clinical activity; discussion. Prerequisite: an internship. Participation in all aspects of pediatric service including inpatient care, outpatient clinics, and emergency room. Responsibility for day-to-day care of patients under supervision of pediatric residents and attending staff. (S/U grading only.)

***491. Clinical Pediatrics** (1-18)
Clinical activity; discussion. Prerequisite: an internship. Interns electing a full year of pediatrics will participate in direct patient care activities in all areas of pediatrics (ward, nursery, outpatient, clinical, and emergency room). Student intern will be directly supervised by Pediatric residents and attending staff. (S/U grading only.)

***499. Research Topics in Pediatrics** (1-18) I, II, III, IV.——— and staff
Prerequisite: student in Medical School with consent of instructor. Individual research project in pediatric subspecialty areas (cardiology, endocrinology, hematology, metabolism, newborn physiology and others) may be arranged with faculty member. Independent research by student will be emphasized and long-term projects are possible. (S/U grading only.)

Pharmacology

Lower Division Courses

92. Internship in Pharmacology (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Work experience—3-36 hours; final report. Prerequisite: lower division student with good academic standing; approval of project prior to period of internship. Supervised work-study experience in pharmacology and related fields. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: lower division standing. Laboratory experience in pharmacology and related fields. (P/NP grading only.)

Upper Division Courses

100. Pharmacology for Educators (2) I, E. K. Killam
Lecture—2 hours. Prerequisite: consent of instructor. Survey of the principles underlying the action of drugs; consideration of the pharmacology of prescription and non-prescription drugs commonly used to treat medical conditions in children of school age; pharmacological aspects of drug dependency and related topics.

101. Introduction to Pharmacology (3) II. Entrikin, Stark
Lecture—3 hours; term paper on nonprescription drugs. Prerequisite: some knowledge of basic physiology and biochemistry. Survey course dealing with principles and selected topics in pharmacology, not intended to be comprehensive with respect to every class of drugs. Oriented specifically to the undergraduate.

192. Internship in Pharmacology (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Work experience—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship. Supervised work-study experience in pharmacology and related fields. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

Graduate Courses

200A. Advanced General Pharmacology (3) I, Stark and staff
Lecture—3 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (111A-111B and 112-113 or the equivalent) may be taken concurrently. Core course in human pharmacology designed for graduate and medical students. Principles in pharmacology, including pharmacokinetics and drug metabolism and the actions, use and toxicity of the major classes of drugs.

200B. Advanced General Pharmacology (4) II. Stark and staff
Lecture—4 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (111A-111B and 112-113) or the equivalent (may be taken concurrently). Core course in human pharmacology, including pharmacokinetics and drug metabolism and the actions, use and toxicity of major classes of drugs.

200AL-200BL. Advanced General Pharmacology (1-1) I, II. Stark and staff
Discussion—1 hour; laboratory—3 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (111A-111B and 112-113) or the equivalent. Laboratory procedures in advanced pharmacology. Experiments and discussion designed to follow subject-matter sequence of 200A-200B.

201. Pharmacology of the Nervous System I: Transmitter Substances (2) I, Hance
Lecture—2 hours. Prerequisite: courses 200A-200B or 400A-400B, or the equivalent. Pharmacology of substances affecting nervous transmission. Offered in odd-numbered years.

202. Pharmacology of the Nervous System II: Hypnotics, Sedatives and Anesthetics (2) III. E. K. Killam
Lecture—2 hours. Prerequisite: courses 200A-200B or 400A-400B, or the equivalent. Pharmacology of centrally-acting sedative, hypnotic, and anesthetic agents with emphasis on alterations in brain function. Offered in odd-numbered years. (S/U grading only.)

203. Pharmacology of the Nervous System III: Stimulants and Anticonvulsants (2) II. Stark
Lecture—2 hours. Prerequisite: courses 200A-200B or 400A-400B, or the equivalent. Pharmacology of stimulant and convulsant agents, anticonvulsant agents and their evaluation in animal models. Offered in even-numbered years.

204. Pharmacology of the Nervous System IV: Drug Alteration of Behavior (1-3) II. K. F. Killam
Prerequisite: courses 200A-200B or 400A-400B, or the equivalent. Activity of drugs altering mood and behavior; psychopharmacologic agents, hallucinogens, antidepressants. Offered in odd-numbered years.

205. Advanced Renal Pharmacology (2) II. West
Lecture—1 hour; discussion—1 hour. Prerequisite: courses 200A-200B or 400A-400B. Study of drugs acting in or affecting the kidney, with particular emphasis on pharmacologic intervention in homeostatic processes subserved by the kidney. Offered in even-numbered years.

206. Pharmacokinetics (2) I, Henderson
Lecture—2 hours. Prerequisite: courses 200A, 200B. Physiochemical and physiological factors affecting absorption, distribution, metabolism and excretion of drugs. Mathematical and graphical methods for determining pharmacokinetic parameters. Calculation of dose regimens. Offered in even-numbered years.

206L. Pharmacokinetics Laboratory (2) I, Henderson
Laboratory—6 hours. Prerequisite: course 206 (may be taken concurrently). Laboratory procedures for determining pharmacokinetic values in experimental animals. Exercises designed to follow subject matter sequence of course 206. Offered in even-numbered years.

208. Application of Computers to Pharmacology (1) I, II, III. The Staff
Lecture—1 hour. Prerequisite: consent of instructor. Presentation of basic concepts and problems.

209. Advanced Pharmacology of Cardiovascular System (3) I, West
Lecture—2 hours; discussion—1 hour. Prerequisite: course 200A-200B or 400A-400B. In-depth study of action and effects of drugs on electrical and mechanical properties of mammalian heart and on mammalian vasculature. Offered in even-numbered years.

210. Fundamentals of Pulmonary Toxicology and Pharmacology (2) II. Hollinger
Lecture—2 hours. Prerequisite: consent of instructor. Major toxicologic and pharmacologic aspects of the lung. Areas considered include: (1) basic lung structure and function, (2) respiratory and non-respiratory lung functions, (3) lung toxins and injury and, (4) principal drugs used in respiratory disorders.

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 and Toxicology (2) III. Winters (in charge) and staff
Lecture—1 hour; seminar—1 hour. Prerequisite: advanced graduate students or postdoctoral fellows. Principles of pharmacology and toxicology related to diagnosis and treatment of drug-induced states as well as principles of therapy of common clinical diseases.

297T. Tutoring in Pharmacology (1-3) I, II, III. The Staff (Chairperson in charge)
Tutorial—3-9 hours. Prerequisite: courses 200A-200B and 200AL-200BL, or the equivalent; consent of instructor. Under supervision of the instructor., students assist in preparation and teaching of courses in Pharmacology. (S/U grading only.)

298. Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Directed reading and discussion of topics in modern pharmacology.

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

400A. Principles of Pharmacology (4) I, Stark and staff
Lecture—29 hours; discussion—16 hours; laboratory—16 hours (61 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Principles in pharmacology, including pharmacokinetics and drug metabolism and the actions, use and toxicity of major classes of drugs. (Quarter V of Medical School curriculum.)

400B. Principles of Pharmacology (5) II. Stark and staff
Lecture—38 hours total; discussion—28 hours total (includes clinical correlations). Prerequisite: consent by Committee on Student Evaluation and Promotion. Principles in pharmacology, including pharmacokinetics and drug metabolism and the actions, use and toxicity of the major classes of drugs. (Quarter VI of the Medical School curriculum.)

472. Clinical Pharmacology and Toxicology (5-10) I, III. Winters and staff
Lecture—2 hours; seminar—3 hours; ward rounds—6 hours. Prerequisite: third- and fourth-year medical students. Basic principles of pharmacology and toxicology will be related to the diagnosis and treatment of drug induced problems as well as principles of therapy. (S/U grading only.) (Same course as Internal Medicine 472.)

490. Seminar in Pharmacology for Medical Students (1) I, II, III, IV. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: consent of instructor. Seminar in pharmacology for medical students.

498. Special Study for Medical Students (1-5) I, II, III, IV. Stark and staff
Lecture, directed reading, and/or discussion groups—3-15 hours. Prerequisite: consent of instructor. Special study in pharmacology for medical students. (S/U grading only.)

499. Directed Research for Medical Students (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Directed research in pharmacology for medical students. (S/U grading only.)

Physical Medicine and Rehabilitation

Upper Division Courses

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: advanced standing and consent of instructor. 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 (Chairperson in charge)
Prerequisite: advanced standing and consent of instructor. Supervise independent study project and research for upper division students or graduate students. (P/NP grading only.)

Graduate Courses

201A. Sports Medicine: Medical Aspects of Sports Injuries (3) I. The Staff (Bernauer, Physical Education, in charge)
Lecture—2½ hours; discussion—½ hour. Prerequisite: graduate students with upper division course in systemic physiology or anatomy. A multidisciplinary course introducing the student to pathophysiology of sports injuries, physical examination of the injured athlete, and management of sports injuries. Specific injuries, taping, and use of physical modalities will be discussed. (S/U grading only.) (Same course as 401A, Physical Education 201A, Orthopaedic Surgery 401A.)

298. Selected Topics in Rehabilitation and Physical Medicine (1-5) I, II, III, IV. The 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.

299. Research (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. Research on topics in the field of physical medicine and rehabilitation. (S/U grading only.)

Professional Courses

401A. Sports Medicine: Medical Aspects of Sports Injuries (3) I. The Staff (Bernauer, Physical Education, in charge)
Lecture—2½hours; discussion—½hour. Prerequisite: medical students who have completed first year of medical school. Multidisciplinary course to introduce the student to pathophysiology of sports injuries. Specific injuries, taping, and use of physical modalities will be discussed. Examination. (Same course as 201A, Orthopaedic Surgery 401A, Physical Education 201A.)

440. Rehabilitation Medicine Clerkship (6) I, II, III, IV. Lieberman
Lecture—5 hours, discussion—2 hours, and laboratory—33 hours (clinical activity—full time 4 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Review of rehabilitation medicine and geriatrics relating to comprehensive care of the physically disabled and the physical medicine management of neurologic and musculoskeletal disorders with supervised clinical experience. Instruction in the physiological effects, indications and contraindications of the therapeutic modalities and their application to common musculoskeletal disorders.

461. Rehabilitation Medicine Clinical Elective (5-18) I, II, III, IV. The Staff (Portwood in charge)
Clinical activity—full time. Prerequisite: completion of third year in Medical School; Medical Sciences 430, 431. Emphasis on evaluation of patients with neurological or orthopaedic problems requiring rehabilitative techniques for their management. Introduction to management of such patients. Fourth-year student may function as acting intern on Physical Medicine and Rehabilitation service.

462. Rehabilitation Medicine Clinical Elective (5-18) I, II, III, IV. The Staff (Portwood in charge)
Clinical activity—full time. Prerequisite: Medical Sciences 430, 431; completion of third year in Medical School. Emphasis on evaluation of patients with neurological or orthopaedic problems requiring rehabilitative techniques for their management. Introduction to management of such patients. Physical Medicine and Rehabilitation at off-campus facility must be approved by Chairperson.

498. Advanced Group Study (1-5) I, II, III, IV. The Staff
Prerequisite: consent of instructor. Study and experience for medical students in any of a number of areas in physical medicine and rehabilitation. (S/U grading only.)

499. Research for Medical Students (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. Research on any of a variety of topics in physical medicine and rehabilitation. (S/U grading only.)

Plastic Surgery

Professional Courses

460. Clinical Plastic Surgery Elective (1-18) I, II, III, IV.
Clinical activity—full time (approximately 70 hours per week). Prerequisite: third- or fourth-year medical students; Medical Sciences 430; consent of instructor. Total involvement in patient care involving surgical preparation, treatment, operative care, and follow-up. Developing and understanding reconstruction and aesthetic plastic surgery. Microvascular surgery included. Student rotation.

470. Microvascular Surgical Techniques in Plastic Surgery (9) I, II, III, IV.
Discussion—4 hours; laboratory—8 hours. Prerequisite: Medical Sciences 430. Instruction in microvascular surgery with operating microscope and microsurgical instruments. It is hoped student will learn surgical techniques enabling him/her to repair vessels as small as 1-2 mm by end of course.

Psychiatry

Upper Division Courses

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Tupin in charge)
Hours to be arranged. Prerequisite: advanced standing and consent of instructor. Reading, conferences, laboratory

NOTE: For key to footnote symbols, see page 123.

and clinical exposure in special topics in general and child psychiatry and psychology. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Tupin in charge)
Hours to be arranged. Prerequisite: advanced standing and consent of instructor. Supervised independent study project and research for upper division students. (P/NP grading only.)

Graduate Courses

***226. Psychiatric Implications of Legal Intervention** (2) I, III. Tupin, Bauer, Schuller
Discussion—2 hours. Prerequisite: consent of instructor. The influence of laws on human behavior, and vice versa, will be explored. Particular emphasis on youth and juvenile court procedure. Moot court demonstrations. (Same course as Community Health 226.)

298. Directed Group Study For Graduate Students (1-5) I, II, III, IV. The Staff (Tupin in charge)
Hours to be arranged. Prerequisite: graduate standing and consent of instructor. Special group study for graduate students in the area of mental health and illness.

299. Special Study for Graduate Students (1-12) I, II, III, IV. The Staff (Tupin in charge)
Hours to be arranged. Prerequisite: graduate standing and consent of instructor. Supervised independent study and research for graduate students. (S/U grading only.)

Professional Courses

400. The Life Cycle: Normal Growth and Development (3) III. Steward
Lecture—23 hours, discussion—10 hours, and laboratory—7 hours (40 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Overview of human growth and development through the life cycle. Emphasis will be on psychosocial and cognitive development. (Quarter III of Medical School curriculum.)

401. Social and Behavioral Medicine (2) III. Sassenrath
Lecture—18 hours and seminar—9 hours (27 hours total). Prerequisite: medical student with consent by Committee on Student Evaluation and Promotion. Biopsychosocial models of illness. (Quarter III of Medical School curriculum.)

402. Human Sexuality (1.5) IV. Blacker
Lecture—18 hours total; discussion—2 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Normal and variant human sexuality. The focus will be on understanding human sexual function in health and illness. (Quarter IV of Medical School curriculum.)

403. Psychopathology (3) II. Rockwell and staff
Lecture—24 hours total; laboratory—20 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Introduction to basic aspects in mental/emotional dysfunction. Focus on understanding the development and symptomatology of major forms of psychiatric dysfunction. (Quarter VI of Medical School curriculum.)

405. Biopsychosocial Aspects of Medical Care (1-4) I, II, III, IV. Tupin and staff
Ward rounds and case conferences—2-8 hours. Prerequisite: medical or graduate† student in Clinical Psychology, or consent of instructor. Ward rounds; case discussions of patients seen on medical, pediatric, and surgical ward program by the Psychiatric Consultation Liaison Service. Focus on interrelationships of biological, psychological and social events in illness.

***408. Child Psychiatry: Principles and Practices** (2) I, II, III, IV. Dorn and staff
Seminar—1½ hours; clinical activity. Prerequisite: consent of instructor. Elective in child psychiatry that provides didactic and clinical work in psychiatry of children, adolescents and their families, as seen in hospital and out, in pediatrics, in psychiatry and in community agencies, such as schools, etc. Clinical observation, direct evaluations and problems in treatment will be undertaken by students under supervision. Relevant literature and research will be reviewed. (S/U grading only.)

409. Family Theory and Family Therapy (3) III. The Staff
Lecture—1 hour; discussion—2 hours. Prerequisite: medical or graduate† student in Clinical Psychology, or consent of instructors. Principles and methods of evaluating the family system and treatment planning. Focus on role of the family in the onset and maintenance of illness seen in the primary care setting. Discussion of cases and videotapes. Prerequisite for course 410.

410. Family Evaluation and Family Therapy (2-4) I, II, III, IV. The Staff
Clinical activity—4-8 hours (one-half quarter). Prerequisite: course 409; medical or graduate† student in Clinical Psychology; or consent of instructor. Evaluation and time-limited treatment of a family with supervision from or as co-therapist with a faculty member in Family Evaluation Unit of Psychiatric Outpatient Clinic. Focus on primary care problems. May be repeated for credit with consent of instructor.

412. Psychiatry Grand Rounds (1) I, II, III, IV. Tupin and staff
Lecture—14 hours. Prerequisite: medical students or staff or other qualified mental health professionals with consent of instructor. Weekly conference at UCD Medical Center for presentation of selected clinical cases, presentation of lecture and research reports.

413. Community Psychiatry—Neighborhood Health Center (6 or 12) I, II, III, IV. Tupin and staff
Clinical activity—full time (4 or 8 weeks). Prerequisite: fourth-year medical student with consent of instructor. Treatment of psychiatric patients under supervision of a member of a Sacramento County Mental Health team based at a neighborhood health center. Participation in usual clinical activities of the center.

414. Liaison with Medicine and Surgery (6 or 12) I, II, III, IV. Tupin
Clinical activity—full time (4 or 8 weeks). Prerequisite: fourth-year medical student with consent of instructor. Inpatient care; clinical rounds; conferences/lectures. Evaluation and treatment (under supervision) of psychosomatic problems in patients on the medical-surgical services at UCD Medical Center. Participation in usual liaison service clinical activities. May be repeated with consent of instructor.

415. Crisis Intervention (6 or 12) I, II, III, IV. Tupin
Clinical activity—full time (4 or 8 weeks). Prerequisite: fourth-year medical student with consent of instructor. Outpatient care; conferences/lectures. Evaluation and treatment (under supervision) of patients at UCD Medical Center Psychiatry Emergency Services and affiliated hospitals. Participation in usual clinical activities of Emergency/Psychiatry Emergency Services.

417. Jail Psychiatry (6 or 12) I, II, III, IV. Green
Clinical activity—full time (4 or 8 weeks). Prerequisite: fourth-year medical student with consent of instructor. Credit varies according to time spent. Primary focus will be on working with juvenile and adult offenders in several settings (including Sacramento County Jail, Psychiatric Unit).

418. Off-Campus Clinical Experience (6 or 12) I, II, III, IV. Tupin and staff
Clinical activity—full time (4 or 8 weeks). Prerequisite: fourth-year medical students; consent of instructor. Clinical or research elective in off-campus medical school or mental health setting. To be arranged with advanced approval of instructor and individual in charge of off-campus setting.

419. Readings in Freud (1) I, II, III. Weinstein
Seminar—five 2-hour sessions. Prerequisite: medical student, psychiatric residents, clinical psychology graduate students,† or consent of instructor. Emphasis on Freud's theoretical works with discussion of Freud's assumptions and statements of his development of psychoanalysis will be described and clarified. (S/U grading only, for all students other than medical students.)

420. Advanced Psychiatric Clerkship (6 or 12) I, II, III, IV. Tupin and staff
Clinical activity—full time (4 or 8 weeks). Prerequisite: fourth-year medical student; completion of core psychiatry rotation. Advanced students with further interest in psychiatry will refine skills in assessment and treatment of in- and/or outpatients. Site of rotation and specific emphasis of experience to be determined for each student based on clinical goals developed in discussion with faculty.

421. Advanced Psychiatry Clerkship: Martinez VA Hospital (12) I, II, III, IV. Hilger, Tamulevich, Weinstein and staff
Clinical activity—full time (8 weeks). Prerequisite: fourth-year medical student; completion of core psychiatry rotation. The student with the staff psychiatrist's supervision is assigned patients for psychiatric examination, evaluations, or treatment needs, and follows patients from admission to discharge. The student will become familiar with psychiatric diagnosis, medications, and treatment modalities and in group and structured milieu.

***498. Directed Group Study** (1-5) I, II, III, IV. The Staff (Tupin in charge)
Prerequisite: consent of instructor.† Medical students desiring to explore particular topics in depth. (S/U grading only for graduate or medical students.)

499. Research (1-12) I, II, III, IV. The Staff (Tupin in charge)
Prerequisite: consent of instructor.† Individual research on selected topics or research projects. (S/U grading only for graduate or medical students.)

Radiology—Diagnostic

Professional Courses

400. Correlative Human Radiologic Anatomy (1) I, Link, Porter, and staff
Lecture—10 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Provides students with an overview of the anatomic structure of the human body from a radiologic aspect. (Quarter I of Medical School curriculum.)

406A-406B-406C. Physics of Diagnostic Radiology (1-1-1) I, II, III. Weinshelbaum
Lecture—1 hour. Prerequisite: one-year college physics course for non-engineering students (e.g., Physics 2A-2B-2C, 3A-3B-3C) or consent of instructor.† Subjects discussed are from fields of basic radiologic physics and physics of diagnostic radiology, and physics of nuclear radiology. Offered at VA Hospital, Martinez. (P/NP grading only for undergraduates; S/U grading for graduate students.)

420. Radiologic Diagnosis I (1) II. Livoni
Lecture—1 hour. Prerequisite: second-year medical students. Development of skills needed for interpretation of radiographs. Emphasis on logical sequence for film reading, and on alternative radiologic procedures available to the modern physician. Gastrointestinal, respiratory and central nervous systems and CT. (S/U grading only.)

421. Radiologic Diagnosis II (1) III. Livoni
Lecture—1 hour. Prerequisite: second-year medical students. Development of skills needed for interpretation of radiographs. Emphasis on logical sequence of film reading, and on alternative radiologic procedures available to the modern physician. Cardiovascular, genitourinary, and osseous systems including the use of diagnostic ultrasound in cardiac, obstetric, and gynecologic diagnosis. (S/U grading only.)

461. Clinical Clerkship in Diagnostic Radiology (1-18) I, II, III, IV. McGahan
Clinical activity—full time (3 days per unit). Prerequisite: completion of third year of Medical School; consent of instructor. Student works with radiologists at UCD Medical Center in film reading sessions and radiological procedures; includes flouoroscopy, vascular radiology and special investigations. Includes daily individual teaching sessions with faculty radiologists, radiology learning laboratory, and all-radiology conferences and seminars. Limited enrollment.

498. Group Study in Diagnostic Radiology (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor.

499. Research in Diagnostic Radiology (1-12) I,II, III, IV. The Staff
Prerequisite: consent of instructor.†

Radiology—General

Professional Course

460. Clinical Clerkship Elective (1-18) I, II, III, IV. Ryan (Woodland Clinic)
Clinical activity—full time (3 days per unit). Prerequisite: completion of second year of Medical School and consent of instructor. Introduction to performance and interpretation and diagnostic x-ray procedures, radiation therapy, and nuclear medicine. Student will participate in radiologic diagnosis and therapy. Emphasis will be on demonstration of basic physiological and pathophysiological use of the x-ray. Limited enrollment.

Radiology—Nuclear Medicine

Upper Division Courses

101. Biomedical Radiochemistry (3) III. S. DeNardo, Mills
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 pharmaco-dynamics and radioimmunoassay. (Same course as 401.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (S. 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 (Stadalnik in charge)
Laboratory—3-15 hours. Prerequisite: upper division standing and consent of instructor. Students will learn the scientific approach and laboratory techniques pertaining to biophysical investigation in the Nuclear Medicine Laboratory. (P/NP grading only.)

Graduate Course

299. Research: Special Study for Graduate Students (1-12) I, II, III, IV. The Staff (Director in charge)
Prerequisite: graduate standing and consent of instructor. Supervised independent study and research for graduate students. (S/U grading only.)

Professional Courses

400. Introduction to Nuclear Medicine (.5) I, G. DeNardo and staff
Lecture—5 hours and discussion—2.5 hours (7.5 hours total). Prerequisite: medical student with consent by Com-

NOTE: For key to footnote symbols, see page 123.

mittee on Student Evaluation and Promotion. Introduction to tracer principles and use of radioisotopes in medicine, including a discussion of technology of nuclear imaging. Normal scan examples presented. (Quarter V of Medical School curriculum.)

400A. Fundamental Nuclear Medicine (4) I, Mills and staff
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. (Quarter IX of Medical School curriculum.)

400B. Fundamental Nuclear Medicine (4) II. S. DeNardo and staff
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. (Quarter VI of the Medical School curriculum.)

401. Biomedical Radiochemistry (3) III. S. DeNardo, Mills
Lecture—2 hours; laboratory—3 hours. Prerequisite: open to graduate† and medical 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. (Same course as 101.)

410. Advanced Medical Interview Techniques (4) I, II, III. G. DeNardo
Discussion—2 hours; laboratory—4-6 hours; patient record preparation. Prerequisite: completion of first year of medical school or the equivalent and/or consent of instructor. Review and advanced instruction in history taking techniques; to evaluate mutual expectations and barriers between physician and his patient; to provide guidance in dealing with difficult medical patients; introductory training in group dynamics. Limited enrollment.

463. Clinical Clerkship in Nuclear Medicine (9 or 18) I, II, III, IV. S. DeNardo
Clinical activity—full time (3 days per unit). Prerequisite: satisfactory completion of second year of Medical School or the equivalent; consent of instructor. Clerkship correlates radioisotopic methods with clinical, pathophysiologic, and other diagnostic aspects of the patient's care. Each patient reviewed with student by faculty member. Reading assignments, informal projects, and research techniques available. Limited enrollment with preference to students enrolling for 18 units.

498. Group Study in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Stadalnik in charge)
Prerequisite: consent of instructor.†

499. Research in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Staldanik in charge)
Prerequisite: consent of instructor.†

Radiology—Radiological Physics

Professional Course

405. Radiological Physics of Diagnostic Radiology (3) I, Seibert
Lecture—3 hours; consent of instructor. Prerequisite: residents in Radiology and Nuclear Medicine, Veterinary Radiology, and medical students. Introductory course in the radiological physics of diagnostic radiology. Subjects discussed include elementary atomic physics production of x-rays, and the physics of diagnostic radiographic procedures. (P/NP grading only for undergraduates.)

Radiology—Therapeutic

Graduate Course

299. Independent Study and Research (1-12) I, II, III, IV. The Staff (Raventos in charge)
Laboratory—9-12 hours. Prerequisite: enrollment with Biophysics Group for Ph.D. candidacy, and consent of group adviser and sponsor. Research under supervision of a member of the department (sponsor). Work must be appropriate to fulfill the requirements for the Ph.D. degree. (S/U grading only.)

Professional Courses

464. Clinical Clerkship Elective (9 or 18) I, II, III, IV. Ordorica
Clinical activity—full time (3 days per unit). Prerequisite: completion of third year of Medical School or the equivalent; consent of instructor. Clinical oncology experience. Student participates in daily treatment planning conferences where all new cases are discussed with whole faculty of therapeutic radiology. Interviews and examines patients for presentation to staff, and reports on selected reading relevant to cases seen. Limited enrollment.

490. Medical Literacy (2) III. Raventos, Monroe
Lecture—1 hour; seminar—1 hour. Prerequisite: consent of instructor. For medical students and hospital residents. Writing and interpreting papers, most examples from current medical literature.

498. Group Study in Therapeutic Radiology (1-12) I, II, III, IV. The Staff.
Prerequisite consent of instructor.†

499. Research in Therapeutic Radiology (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.† (S/U grading only for medical students.)

Surgery

Upper Division Courses

192. Internship in General Surgery (1-12) I, II, III, IV. The Staff
Work-learn experience—3-36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-study experience in general surgery and related fields. (P/NP grading only.)

199. Special Study in General Surgery for Advanced Undergraduates (1-5) I, II, III, IV. The Staff
Prerequisite: advanced undergraduate student with consent of instructor. Independent research studies under direction of a faculty member. (P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III, IV. Wolfe in charge
Attendance at Surgical Research Conference—3-36 hours. Prerequisite: graduate standing and consent of instructor. Supervised independent study and laboratory research for graduate students. (S/U grading only.)

Professional Courses

419. Introduction to Clinical Surgery (1-6) I, II, III, IV. Ward
Clinical activity—full time. Prerequisite: second-year medical student with consent of instructor. Designed to introduce medical students to basic principles of surgical practice and the most common surgical diseases. Course will afford opportunity to review surgical patients and discuss them with members of staff.

421. Practical Laboratory Experience (2) I, II, III, IV. Holcroft and staff
Discussion—1 hour; laboratory—3 hours. Prerequisite: third-year medical student; Medical Sciences 430 (concurrently); consent of instructor. Practical laboratory experience in clinical surgery and in surgical techniques used to obtain physiological information. (S/U grading only.)

460. Clinical Surgical Elective (6-18) I, II, III, IV. Ward and staff
Clinical activity—full time. Prerequisite: fourth-year or third-year medical student; Medical Sciences 430. Involves preparation of patients, treatment, operative care, and postoperative follow-up. Services include Cardiopulmonary, Pediatric, Nutrition, Oncology, and Surgery Clinic.

461. Surgery Burn Unit Clerkship (6 or 9) I, II, III, IV. The Staff
Clinical instruction—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student functions as an extern in the eight-bed Burn Unit; learns principles of critical care, fluid and electrolyte resuscitation and management of surgical wounds.

462. Surgery Trauma Service Clerkship (6 or 9) I, II, III, IV. Blaisdell and staff
Clinical instruction—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student works as an extern on one of the two general surgery Trauma teams, participating in resuscitation and management of critically injured patients. Team hours consist of 24 hours on, and 24 hours off.

463. Surgery Intensive Care Unit (6 or 9) I, II, III, IV. Holcroft and staff
Clinical instruction—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student participates in direct supervision of critically ill surgical patients in a twelve-bed surgery ICU. Each student is closely supervised. Provides in-depth experience with management of critically ill patients.

464. General Surgery Clerkship: Kaiser Hospital (6 or 9) I, II, III, IV. The Staff
Clinical instruction—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student participates with University residents on the teaching services at Kaiser Hospital, Sacramento. Opportunity to see larger number of practical, general surgical problems and participate in their care.

465. General Surgery Clerkship: Martinez VA Hospital (6, 9, or 12) I, II, III, IV. Guernsey, Ward
Clinical instruction—full time (4, 6, or 8 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Part of the General Surgery residency training program with the University of California, Davis. The Martinez rotation has a large number of gastrointestinal and vascular surgical problems as well as broad surgical experience.

466. General Surgery Clerkship: Travis AF Base Hospital (6 or 9) I, II, III, IV. Gillmore, Ward
Clinical instruction—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Opportunity to participate on the surgical service of our affiliated Air Force Hospital. The program has a large number of general surgery problems and provides a broad clinical experience in surgery.

467. Surgical Oncology (6 or 9) I, II, III, IV. Goodnight and staff
Clinical instruction—full time (4 or 6 weeks). Prerequisite: fourth-year medical student, or third-year medical student with completion of Medical Sciences 430. Student works as part of the Surgical Oncology team learning medical and surgical principles applicable to cancer. Participation in the care and major surgical oncologic problems and has the opportunity to learn medical, radiologic, and surgical approaches to cancer therapy.

478. Surgical Preceptorship: Off Campus (6-18) I, II, III, IV. Ward
Clinical activity—full time. Prerequisite: fourth-year medical student and consent of instructor. Student participates in the preoperative, operative and postoperative care of surgical patients under the supervision of attending staff.

494H. Fourth-Year Surgical Honors Program (18) I, II, III, IV. Wolfman
Prerequisite: completion of third year of Medical School with superior performance on Medical Sciences 430; consent of instructor. To provide intensive and comprehensive training in surgery to students interested in postgraduate surgical career, that would enable them to succeed during the internship and residency training. (S/U grading only.)

499. Laboratory Research (1-12) I, II, III, IV. Ward and staff
Laboratory—3-36 hours. Prerequisite: completion of second year of medical school; consent of instructor. Laboratory research on surgically related problems. Participation in projects to include the following: burn, nutrition, oncology, transplant and others. (S/U grading only.)

Urology

Lower Division Course

99. Special Study for Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Unique opportunity to apply recent technologies (nuclear medicine resonance, monoclonal antibodies, flow cytometry, recombinant DNA, etc.) in the investigation, diagnosis and treatment of genitourinary cancer, infectious disease, male infertility and development of genitourinary bioprosthetics. (P/NP grading only.)

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Unique opportunity to apply recent technologies (nuclear medicine resonance, monoclonal antibodies, flow cytometry, recombinant DNA, etc.) in the investigation, diagnosis and treatment of genitourinary cancer, infectious disease, male infertility and development of genitourinary bioprosthetics. (P/NP grading only.)

Graduate Course

299. Research in Urology (1-12) I, II, III, IV. J.D. Smith in charge
Prerequisite: graduate standing and consent of instructor. Application of recent technologies (nuclear medicine resonance, monoclonal antibodies, flow cytometry, recombinant DNA, etc.) in the investigation, diagnosis and treatment of genitourinary cancer, infectious disease, male infertility and development of genitourinary bioprosthetics. (S/U grading only.)

Professional Courses

400. Office Urology (1) I, II, III, IV. Palmer
Clinical activity—4 hours in afternoons (6 weeks). Prerequisite: fourth-year medical students with consent of instructor. Introduction to ambulatory care of urologic patients including basic therapeutic and diagnostic procedures from case

NOTE: For key to footnote symbols, see page 123.

material referred to private clinic. Management of urinary tract infection will be emphasized.

420. Urinary System (3.5) III. Lewis, Gulyassy
Lecture—24 hours, discussion—18 hours, and laboratory 10 hours (52 hours total). Prerequisite: approval by Committee on Student Evaluation and Promotion. Fundamental aspects of (a) disorders of body water, electrolytes and acid/base balance; (b) major categories and mechanisms of parenchymal renal diseases; (c) major congenital and acquired urologic diseases; (d) urinary tract infections. (Quarter VII of Medical School curriculum.) (Same course as Internal Medicine 420E.)

460. Urology Clinical Clerkship (5-18) IV, I, II, III. Palmer.
Clinical activity—full time. Prerequisite: second-year medical student; physical diagnosis or the equivalent; consent of instructor. Clinical experience in diagnosis and treatment of urologic disease. Student will work closely with house staff, participate in conferences and surgery, and perform initial patient evaluation on new patients. May be repeated for credit. Limited enrollment.

461. Externship in Urology (5-18) I, II, III, IV. Palmer
Clinical activity—full time. Prerequisite: fourth-year medical students with consent of instructor. Under supervision, student acting as intern will assume full inpatient responsibility including admission history, physical examination, management of hospitalization, and participate in surgical procedures, outpatient clinic and learning diagnostic and therapeutic procedures. May be repeated for credit.

465. Surgical Team Participation: Martinez VA Medical Center (6 or 12) I, II, III, IV. Merrill
Clinical clerkship—full time (4 or 8 weeks); lecture—varied. Prerequisite: third- or fourth-year medical student; Medical Sciences 430. Students will participate in care of assigned patients on a busy urology inpatient service and outpatient clinic. Clerkship provides exposure to urologic procedures performed in operating room and cystoscopic suite under supervision of Urology staff physicians.

498. Lecture in Urology (1) I, II, III, IV. Palmer
Lecture—1 hour. Prerequisite: completion of second year of medical school. Group lecture-discussion will cover major urologic topics including anatomy, renal physiology, urinary tract infection, congenital anomalies, urologic cancer, trauma, renal transportation, methods of diagnosis, and uroradiography. (S/U grading only.)

499. Research in Urology (1-12) I, II, III, IV. E.L. Lewis, Palmer, J.D. Smith
Research—3-36 hours. Prerequisite: medical or veterinary medical students with consent of instructor. Research in oncology, male infertility, urodynamics, neurogenic bladder. Unique opportunity to apply recent technologies (nuclear medicine resonance, flow cytometry, recombinant DNA) in investigation, diagnosis and treatment of GU cancer, infectious disease, male infertility and development of genitourinary bioprosthetics.

Medicine

(School of Veterinary Medicine)

Alexander A. Ardans, D.V.M., M.S., Chairperson of the Department

Department Office, 2106 Medical Science 1A (752-1363)

Faculty

Terence C. Amis, B.V.Sc., Ph.D., Assistant Professor
Alexander A. Ardans, D.V.M., M.S., Professor
Dale L. Brooks, D.V.M., Ph.D., Adjunct Lecturer
Gary P. Carlson, D.V.M., Ph.D., Associate Professor
Larry D. Cowgill, D.V.M., Ph.D., Associate Professor
Laurence R. Enos, Pharm.D., Adjunct Lecturer
Murray E. Fowler, D.V.M., Professor
Lisle W. George, D.V.M., Ph.D., Assistant Professor
Ron Hedrick, Ph.D., Assistant Professor
Roy V. Henrickson, D.V.M., Adjunct Lecturer
Charles A. Hjerpe, D.V.M., Professor
Peter J. Ihrke, V.M.D., Assistant Professor
Gerald V. Ling, D.V.M., Professor
Donald G. Low, D.V.M., Ph.D., Professor
John Madigan, M.S., D.V.M., Assistant Professor
Blaine McGowan, Jr., D.V.M., Professor
Niels C. Pedersen, D.V.M., Ph.D., Professor
William R. Pritchard, D.V.M., Ph.D., J.D., Professor
Livio G. Raggi, D.V.M., Ph.D., Professor Emeritus
Sigmund T. Rich, D.V.M., Lecturer
Edward A. Rhode, D.V.M., Professor
Bradford P. Smith, D.V.M., Associate Professor
Anthony A. Stannard, D.V.M., Ph.D., Professor *(Medicine, Pathology)*
Donald R. Strombeck, D.V.M., Ph.D., Professor
William P. Thomas, D.V.M., Associate Professor
Mark C. Thurmond, D.V.M., M.P.V.M., Ph.D., Assistant Professor
Leon D. Weaver, V.M.D., Senior Lecturer
James F. Wilson, D.V.M., J.D., Adjunct Lecturer
W. David Wilson, B.V.M.S., M.R.C.V.S., Assistant Professor

Part-Time Clinical Faculty

Robert A. Busch, Ph.D., Associate Clinical Professor
Leslie Dierauf, V.M.D., Assistant Clinical Professor
Fredric L. Frye, D.V.M., M.S., Clinical Professor

Courses in Medicine

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Ardans in charge)
(P/NP grading only.)

Graduate Courses

***290. Seminar in Veterinary Medicine** (1) I, II, III. The Staff (Ardans in charge)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: student in School of Veterinary Medicine or consent of instructor. Group study in selected areas of the clinical sciences. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Ardans 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 (Smith 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. Amis
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.)

2. Large Animal Grand Rounds (½) I, II, III. The Staff (Carlson 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)

Dennis J. Dutschke, Ph.D., Program Director

Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

Dennis J. Dutschke, Ph.D. *(Italian)*
Robert J. Grigg, Ph.D. *(Art)*
Winder McConnell, Ph.D. *(German)*,
James J. Murphy, Ph.D. *(Rhetoric)*
Marijane Osborn, Ph.D. *(English)*
Alan A. Stambusky, Ph.D. *(Dramatic Art)*
Valerie A. Tumins, Ph.D. *(Russian)*

The Major Program

The major in Medieval Studies is designed to introduce you to the main features of European civilization during the period from the fall of Rome to the beginnings of the Renaissance. Medieval studies are inherently interdisciplinary. The program involves studies in history, art, philosophy, literature, drama, music, national languages, religion, rhetoric, and political theory.

Medieval Studies

A.B. Major Requirements:

UNITS

Preparatory Subject Matter
Recommended: Art 1B, History 4A, Philosophy 21, Medieval Studies 20A, 20B, 20C, Religious Studies 10.
Language proficiency is a necessity; courses in Latin and other European languages are strongly recommended, particularly for students planning to pursue graduate studies in the medieval field.

NOTE: For key to footnote symbols, see page 123.

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, 113A, 113B, 150A, 188, 189.
- (b) French 115, 141.
- (c) German 120, 121A, 122.
- (d) Italian 113A, 113B, 115A, 115B, 139A, 139B.
- (e) Latin 101, 102, 103, 104, 105, 106, 108, 109, 111A, 111B, 111C, 112, 114, 115, 116.

Philosophy and religion, at least 8 units from Philosophy 105, 132, 145, 146, 190; Religious Studies 102, 110 8
Arts and language, at least 8 units from Art 176A, 176B, 176C, 177A, 178A, 178B; Dramatic Art 156, German 106; Music 121 (note prerequisite), 199; Rhetoric 110, 111 8
Political thought, at least one course from Political Science 115, 116, 118A 4
Senior thesis, Medieval Studies 190 4

Total Units for the Major **52**

Major Advisers. W. M. Bowsky *(History)*, D. J. Dutschke *(Italian)*, W. McConnell *(German)*, J. J. Murphy *(Rhetoric)*, D. A. Traill *(Classics)*, V. A. Tumins *(Russian)*.

Courses in Medieval Studies

Lower Division Courses

20A. Early Medieval Culture (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Readings (in translation) in early medieval culture, such as the *Codes* of Justinian, the *Confessions* of Saint Augustine, *The Consolation of Philosophy* of Boethius, *Beowulf*, the *Nibelungenlied*, and the *Song of Roland*.

20B. The Culture of the High Middle Ages (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Readings (in translation) in the culture of the high Middle Ages, such as the *Summa Theologica of Thomas Aquinas*, the chronicles of Froissart, *The Canterbury Tales* of Chaucer, and the *Divine Comedy* of Dante.

20C. Medieval Transformations (4) III. The Staff
Lecture—2 hours; discussion—1 hour; paper or formal presentation. Course deals with the great medieval transformations that took place before the Renaissance. Topics will be selected from various disciplines, such as literature, philosophy, religion, history, art, music, political thought, rhetoric, and other pertinent fields.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

120A-F. The Medieval World (4) I, II, III. The Staff (Chairperson in charge)
Lecture—2 hours; discussion—1 hour; term paper. Course deals with selected themes from the Middle Ages; the Fall of Rome to the beginning of the Renaissance. Subjects will vary from year to year and cover such topics as **(A)** The Monastic Orders: **(B)** Origins of Universities; **(C)** The Seven Liberal Arts, and their Significance in the Middle Ages; **(D)** Family and Society; **(E)** Chivalry; and **(F)** Church and State.

190. Senior Thesis (4) I, II, III. The Staff
Seminar—4 hours. Prerequisite: senior standing and major in Medieval Studies. Preparation of a research paper dealing with a selected aspect of medieval culture, under supervision of three members of the Committee in Charge.

197T. Tutoring in Medieval Studies (1-4) II, III. The Staff (Chairperson in charge)
Seminar—2 hours. Prerequisite: courses 20A and 20B; upper division standing; consent of instructor and chairperson of curriculum committee. Tutoring in Medieval Studies 20A and 20B, including leadership in small discussion groups affiliated with the course. May be repeated for credit for a total of 6 units. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Mexican-American (Chicano) Studies

(College of Letters and Science)

[3]Adaljiza Sosa-Riddell, Ph.D., Program Director

Program Office, 211 North Hall (752-2428)

Committee in Charge

Luis L. Arroyo, Ph.D. *(History)*
Angie C. Chabram, M.A. *(Chicano Studies, Spanish)*
Richard A. Figueroa, Ph.D. *(Education)*
Barbara J. Merino, Ph.D. *(Education)*
Daniel M. Ramirez, Ph.D. *(Sociology)*
Refugio I. Rochin, Ph.D. *(Agricultural Economics)*
[3]Adaljiza Sosa-Riddell, Ph.D. *(Chicano Studies)*, Chairperson
Lenora A. Timm, Ph.D. *(Linguistics)*

Faculty

Angie C. Chabram, M.A., Acting Assistant Professor *(Spanish)*
[3]Adaljiza Sosa-Riddell, Ph.D., Lecturer

The Major Program

The interdepartmental major now allows for two emphases, one in humanities and the other in sociology. The *humanities* track introduces the student to the Spanish language, linguistics, Mexican and Mexican-American history, culture and literature, and social sciences. This curriculum allows for flexibility to accommodate primary interests in bilingual education, community or social service, or advanced professional preparation. The *sociology* track combines traditional courses in sociology with substantive area courses that deal intensively with the Mexican-American experience. The sociology emphasis promotes a greater understanding of the social, political, and cultural life of Mexican-American people, and it provides a solid basis of knowledge for those who wish to work in a bi-cultural setting. It is designed for students interested in public service careers such as law school, graduate school, public administration, or community groups.

Students who have demonstrated language fluency in Spanish through the placement examination can accelerate their program considerably; thus the language placement examination is strongly recommended to all students entering the program.

Mexican-American (Chicano) Studies

A.B. Major Requirements:

Humanities Emphasis

	UNITS
Preparatory Subject Matter	**8-38**
Spanish 1 or 1ATA, 2 or 2ATA, 3; (or the equivalent)	0-18
Spanish 4 or 7A, 5 or 7B, 28 or 7C	0-12
Linguistics 1	4
Chicano Studies 10	4
Depth Subject Matter	**38-40**
Sociology 110†	4
Spanish 126, 129, 135	12
One course from Spanish 131, 132, 133	3-4
One course from Linguistics 115, 150 or Education 151	3-4
History 169A, 169B; 166A or 166B	12
Political Science 168	4
Total Units for the Major	**46-78**

Recommended Linguistics 115 and 150 (above), American Studies 45; two courses from Spanish 8A, 8B, 9 (for non-native speakers of Spanish); English 2 (for native speakers of Spanish); two courses from Sociology 124, 130; Anthropology 104, 105A, 139B; Spanish 108B, 132 and 133 (above), 300.

†Spanish 124 may be substituted for Sociology 110.

Sociology Emphasis

	UNITS
Preparatory Subject Matter	**21-33**
Chicano Studies 10	4
Spanish 4 or 7A, 5 or 7B, 28 or 7C	0-12
Sociology 1, 46A, 46B	13
Linguistics 1	4
Depth Subject Matter	**42**
Sociology 110, 140, 165A, 169	16
Chicano Studies 102	4
History 169B	4
Linguistics 115	3
Political Science 168	4
Electives, a maximum of 12 units chosen from any of the following courses with no more than 2 courses from any one group	12
Group 1: History 166A, 166B, or 169A	
Group 2: Education 116, Linguistics 150, Spanish 126	
Group 3: Anthropology 163, Sociology 118, Agricultural Economics 150	
Group 4: Applied Behavioral Sciences 172, 176, Chicano Studies 101	
Total Units for the Major	**63-75**

Further Study. If you are contemplating studies in a graduate or professional school you can, with the aid of an adviser, build a program around the discipline of your choice, i.e., Spanish or Spanish-American literature, history, or political science. If you are contemplating a career in bilingual education you should consult the Department of Education for information about the Teacher Credential Program (see also page 98).

Major Advisers. L. L. Arroyo *(History)*, *A.C. Chabram (Chicano Studies, Spanish)*, D. M. Ramirez *(Sociology), (Spanish)*, *A. Sosa-Riddell (Chicano Studies)*.

Minor Program Requirements:

This interdepartmental minor provides the student with a general view of the Chicano in terms of the history, culture, political involvement and role in the society of the Southwestern United States.

	UNITS
Mexican-American (Chicano) Studies	**23-24**
Chicano Studies 10	4
History 169A or 169B	4
Sociology 110	4
Political Science 168	4
Two elective courses to be chosen from Education 116, 151; History 169A or 169B (not to duplicate one of the above); Linguistics 115; Sociology 169, Spanish 126	7-8

Courses in Chicano Studies

Lower Division Courses

10. Introduction to Chicano Studies (4) I, Sosa-Riddell
Lecture—3 hours; discussion—1 hour. Analysis of the situation of the Chicano (Mexican-American) people, emphasizing their history, literature, political movements, education and related areas.

98. Directed Group Study (1-5) I, II, III. The Staff (Sosa-Riddell in charge)
(P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Sosa-Riddell in charge)
(P/NP grading only.)

Upper Division Courses

101. Political Economy of Chicano Communities (4) III. Sosa-Riddell
Lecture-discussion—4 hours. Prerequisite: upper division standing; a lower division Chicano Studies course recommended. Historical and contemporary study of political and economic forces which define and influence the development of Chicano communities. Includes critiques of traditional and Marxian theories and concepts applicable to Chicano communities, case studies of Chicano communities, especially in California and Texas.

102. Chicanas in Contemporary Society (4) III. Sosa-Riddell
Lecture—3 hours; term paper. Prerequisite: course 10 or

NOTE: For key to footnote symbols, see page 123.

Spanish 124 or History 169B. Analysis of the role and status of Chicanas in contemporary American society. Special emphasis is on their historical role, the political, economic and social institutions which have affected their status, and their contributions to society and their community.

198. Directed Group Study (1-5) I, II, III. The Staff (Sosa-Riddell in charge)
Prerequisite: upper division standing and consent of Program Chairperson. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Sosa-Riddell in charge)
Prerequisite: upper division standing and consent of Program Chairperson. (P/NP grading only.)

Microbiology

See below; also see Medical (page 260) or Veterinary Microbiology

Microbiology (A Graduate Group)

Paul Baumann, Ph.D., Chairperson of the Group

Group Office, 156 Hutchison Hall (752-0262)

Graduate Study. The Graduate Group in Microbiology offers study and research leading to the M.A. and Ph.D. degrees. For information on the graduate study and undergraduate preparation for the program contact the graduate adviser or the Chairperson of the group. See also page 94.

Graduate Advisers. B. L. Beaman (Medical Microbiology); Y. C. Zee (Veterinary Microbiology); P. Baumann (Bacteriology); M. W. Miller (Food Science and Technology).

Courses in Microbiology

Graduate Courses

290C. Advanced Reseach Conference (1) I, II, III. The Staff (Baumann in charge)
Discussion-conference—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and critical discussion of staff research activities. Designed for advanced graduate students. May be repeated for credit. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
Laboratory—variable. Research under the guidance of dissertation committee. (S/U grading only.)

Military Science

(College of Letters and Science)

William N. Ritch, Major, Chairperson of the Department

Department Office, 125 Hickey Gymnasium (752-0541)

Faculty

Mike T. Eastman, Major, Assistant Professor
Randall L. Peters, Captain, Assistant Professor
William N. Ritch, Major, Professor
Ronald J. Surface, Major, Assistant Professor
David R. Tommervik, Major, Assistant Professor

Program of Study

The Military Science Department extends the educational opportunities and provides extracurricular activities which qualify a student for a commission in the Army Reserve or Regular Army. The program assists qualified students in all academic fields to prepare for positions of leadership in military or civilian careers. A continuing effort is made to assign graduates to military career fields aligned with their major field of study, individual capabilities and preferences. Active duty obligation for ROTC graduates will not exceed three years for those who choose Active Duty or six months for those who choose Reserve Component Duty. A liberal scholarship program is available. The Army offers four-three-, and two-year scholarships. The four-year is awarded to high school seniors who will be freshmen at U.C. Davis. The three-year and two-year are awarded to freshmen and sophomores who are already attending college. Application for the four-year scholarship is completed prior to December 1 of the senior year in high school. The three-year and two-year scholarship applications are made during February of the freshman or sophomore year.

Department Programs

Students are enrolled in military science under one of two programs.

Four-Year Program

Students are enrolled in the basic course (lower division) for the first two years on a voluntary basis. There is no military obligation associated with attendance in lower division courses. Admission to the advanced course (upper division) is by application from second-year lower division students who meet the academic, physical and military aptitude requirements. Qualified veterans can enter the advanced course immediately because of their military service experience, upon approval by the Department Chairperson.

Upper division students receive $100 subsistence per month after executing a contract agreeing to complete the course and accept a commission if offered. During the course all military science text books, uniforms and equipment are provided without cost. Students are given leadership development experience at summer camp between their third and fourth years of the course. Emphasis is on individual participation, leadership development and the capability to function effectively in positions of significant responsibility.

Two-Year Program

This program is designed for students who have not attended lower division Military Science classes. In lieu of lower division courses an applicant attends a six-week summer camp which is voluntary and carries no military obligation. Applicants are paid for camp attendance and transportation costs. Applications are accepted during winter term of the year preceding enrollment in the two-year program. All other provisions explained above for the upper division course apply to the two-year program. Other methods for entering the upper division program are available by arrangement with the department.

Scholarship Program

Four-year merit scholarships are awarded to high school seniors in nationwide competition. Two-, and three-year scholarships are applied for through the Military Science Department after entering the University. Scholarship winners receive all tuition, fees, a flat rate for books, uniforms, and $100 subsistence allowance per month.

Scholarship students incur a four-year active duty military obligation.

For further details on these scholarships contact the department.

Leadership Laboratory

During the course of the school year several weekends, and two hours per week are spent in the conduct of practical exercises. Classes emphasize adventure activities including mountaineering techniques, orienteering, and rifle marksmanship. All cadets are required to attend leadership laboratories for practical leadership experience and to prepare for attendance at ROTC Advanced Camp.

Air Force ROTC

Air Force ROTC is available to UC Davis students through a program offered at California State University, Sacramento (CSUS). Their Department of Aerospace Studies (AFROTC) offers a two- or four-year program leading to a commission in the United States Air Force. All course work (12 or 16 semester units) is completed on the CSUS campus with the exception of Field Training conducted during part of the summer at an active Air Force base and the Flying Instruction Program which operates from a local civilian flying school. Upon completion of the Program (integrated with UCD's quarter system) and all requirements for the Bachelor's degree, cadets are commissioned second lieutenants in the Air Force and serve a minimum of four years on active duty. Graduates who are qualified and selected may enter pilot or navigator training immediately upon graduation, or serve in a specialty consistent with their academic major, individual goals, and existing Air Force needs. Graduates may request a delay of entry on active duty to continue their education or may apply for Air Force sponsored graduate study to begin immediately upon entry on active duty.

Application to the AFROTC Program must be no later than the middle of a student's sophomore year. Contact representatives in the Aerospace Studies Department at CSUS, telephone (916) 454-7315, for information on the program or processing of entry. (An AFROTC Program is also available within the UC system at Berkeley campus, Department of Aerospace Studies, (415) 642-3572.)

AFROTC offers 3½-, 3-, 2½-, and 2-year scholarships to qualified students. Applications are accepted in a variety of academic disciplines; however, particular emphasis will be given to applicants in the fields of engineering and navigation.

Academic Credit

College of Letters and Science. The Bachelor of Arts degree requires the completion of 180 units. Military Science courses are counted in the allowance for electives.

College of Agricultural and Environmental Sciences. The Bachelor of Science degree in agriculture requires the completion of 180 units. Military Science courses are counted in the unit allowance for electives.

College of Engineering. Military Science units are acceptable toward the require ments for the Bachelor of Science degree to the extent of the unrestricted elective units available in the curriculum being followed.

School of Veterinary Medicine. The number of Military Science units acceptable toward the Bachelor of Science degree in Veterinary Medicine is on an individual program basis approved by the Dean of the School. Graduates with the D.V.M. degree may apply for direct commission in the United States Army Veterinary Corps.

Courses in Military Science

Lower Division Courses

11. Introduction to Military Science, I (1) I. The Staff
Lecture—1 hour. A discussion of the military as an element of national security and international diplomacy. Course surveys the United States defense structure to include military treaties and organizations.

12. Introduction to Military Science, II (1) II. The Staff
Lecture—1 hour. A discussion of the military's role in American society. Course focuses on current social attitudes within the military and discusses technological developments of modern military forces.

13. Introduction to Military Science, III (1) III. The Staff
Lecture—1 hour. A survey of the organization and structure

NOTE: For key to footnote symbols, see page 123.

of the United States Army. Course includes discussions of various branches of the Army, their roles in the overall organization, and their interface with one another.

21. Military History, I (2) I. The Staff
Lecture—2 hours. An analysis of selected historical military campaigns and battles. Emphasis is on continuity of principles of warfare throughout the ages. Course covers period from Graeco-Persian Wars to Age of Louis XIV.

22. Military History, II (2) II. The Staff
Lecture—2 hours. Survey of selected campaigns and battles from American Revolution era to end of nineteenth century. Emphasis is on the foundation and development of modern American and European military organizations.

23. Military History, III (2) III. The Staff
Lecture—2 hours. An analysis of modern military conflict from World War I to present. Emphasis is on development of mechanized warfare and its impact on current worldwide military doctrine.

Upper Division Courses

131. Principles of Military Instruction (2) I. The Staff
Lecture—2 hours. Principles and practice in fundamentals applicable to military instruction to include planning, presentation and evaluation. Student presentations exemplify lecture material.

132. Theory of Leadership (2) II. 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) III. 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. Principles of Military Administration (2) I. The Staff
Lecture—2 hours. Discussion of the functions of military staff organizations to include military briefings, correspondence, procedures, and the system of military administration.

142. Managerial Principles and Theories (2) II. The Staff
Lecture—2 hours. Military administrative principles and personnel management theories, including the military occupational structure, and the administration of military justice.

143. Revolutionary Conflict (2) III. The Staff
Lecture—2 hours. Analysis of revolutionary conflict to include an examination of insurgency and counterinsurgency movements in the world arena.

Music

(College of Letters and Science)

D. Kern Holoman, Ph.D., Chairperson of the Department

Department Office, 112 Music Building (752-0666)

Faculty

Lawrence E. Anderson, Ph.D., Adjunct Lecturer
Robert S. Bloch, M.A., Professor
David Cairns, B.A., Visiting Professor
[3]Sydney R. Charles, Ph.D., Professor
Andrew D. Frank, M.A., Associate Professor
Vincent Gomez, M.A., Visiting Professor
D. Kern Holoman, Ph.D., Professor
Peter D. Lopez, Ph.D., Visiting Lecturer
[2]Albert J. McNeil, M.S., Professor
Martin Neary, M.A., Visiting Professor *(Artist-in-Residence)*
David A. Nutter, Ph.D., Assistant Professor
[4]Jerome W. Rosen, M.A., Professor
Leland Smith, M.A., Visiting Professor
Richard G. Swift, M.A., Professor
William E. Valente, M.A., Professor

Faculty Affiliates in Applied Music

Dona Lee Brandon, M.S.M., Adjunct Lecturer *(organ)*
Lois Brandwynne, M.A., Visiting Lecturer *(piano)*
James Crenshaw, Visiting Lecturer *(French horn)*
Thomas Derthick, B.M., Visiting Lecturer *(string bass)*
Carol Doehne, B.M., Visiting Lecturer *(oboe)*
Joel Elias, M.M., Visiting Lecturer *(trombone)*
Stephanie Friedman, M.A., Visiting Lecturer *(voice)*
David Granger, M.M., Visiting Lecturer *(bassoon)*
Edward Higgins, M.M., Visiting Lecturer *(trumpet)*
Bruce Lamott, Ph.D., Visiting Lecturer *(harpsichord)*
Stanley Lunetta, M.A., Visiting Lecturer *(percussion)*
Robin Richman, B.M., Visiting Lecturer *(flute)*

The Robert Bloch String Quartet of UC Davis

Robert S. Bloch, M.A., violin
Elizabeth Gibson, M.M., violin
Duncan Johnstone, viola
Deidre Cooper, cello

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. Options are provided for those students with special interests in composition, history, teaching and performance, and for those who plan to continue in graduate work in music. The Department of Music offers a Master of Arts degree with emphasis on composition or music history, and a Master of Arts in Teaching degree with emphasis on the teaching of music.

Music

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**54**
Music 4A, 4B, 4C, 5A, 5B, 5C, 24A, 24B, 24C 25A, 25B, 25C	51
Music 30, 31 (or the equivalent as determined in consultation with major adviser), one year	3
Depth Subject Matter	**36**
Music 104A, 104B, 104C	12
At least eight units selected from Music 113A, 113B, 121, 122, 190	8
At least four units selected from Music 107A, 107B, 107C, 108A, 108B, 111, 112, 198, 199	4
Additional upper division courses in Music to achieve 36 units minimum	12
Units may be chosen from remaining courses listed above, and upper division performance courses listed below. Performance courses will count toward fulfillment of both the 36 upper division unit requirement and the 14 performance unit requirement.	
Performance	**14**
At least 14 units from Music 41, 42, 43, 44, 45, 46, 130, 131, 141, 142, 143, 144, 145, 146.	
Piano Skills	**0**
Music P (required of students with a deficiency in piano playing).	
Total Units for the Major	**92**

Beginning and transfer students must take an examination in piano playing. Sufficient pianistic ability to perform four-part chorales and compositions comparable in difficulty with *The Little Preludes* of Bach is prerequisite to upper division courses in the major. Students with deficiencies will be required to pass Music P. All majors in music will be expected to perform the compositions cited above before a jury of faculty members prior to advancement into the upper division. Students transferring from other colleges should take the Placement Examination and consult with departmental major advisers before enrolling in any music course.

Foreign Language Requirement. Attention is called to the requirements in foreign languages for higher degrees in music: 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. S. R. Charles, W. E. Valente.

Minor Program Requirements:

	UNITS
Music	**18**
A minimum of eighteen units of upper division Music courses	18
Must include a maximum of six units of performance courses (130, 141, 142, 143, 144, 145, 146).	
The remaining units are to be selected from Music 104A, 104B, 104C, 107A, 108A, 108B, 110A, 110B, 110C, 110D, 111, 112, 113A, 113B, 121, 122, and 198.	
Lower-division preparatory work to be determined in consultation with minor advisers.	

Teaching Credential Subject Representative. A. J. McNeil. See page 98 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. D. K. Holoman.

Courses in Music

Lower Division Courses

PA-PB-PC. Rudimentary Piano (no credit) I, II, III. The Staff (Holoman in charge)
Laboratory—2 hours. Prerequisite: students enrolled in course 4A-4B-4C. Designed for students requiring training to meet the minimal piano requirements for the major or minor in music. (P/NP grading only.)

1. Basic Musicianship (3) I. Gomez; II, III, Anderson
Lecture—3 hours. Fundamentals of music, singing, ear-training and conducting for beginners in music. Designed for students with career plans where musical literacy is important, for example, primary level classroom teachers, actors, theatre directors, designers, and stage managers. Not open to students who have successfully completed 3A, 4A, or the equivalent.

3A. Introduction to Music Theory (4) I, Rosen. II, Bloch; III, ———
Lecture—3 hours; laboratory—1 hour. Fundamentals of music theory, ear-training, harmony, counterpoint and analysis directed toward the development of listening and writing techniques. Course 3A is prerequisite to course 3B. Intended for the general student.

3B. Introduction to Music Theory (4) II, Rosen; III, Bloch
Lecture—3 hours; laboratory—1 hour. Continuation of course 3A. Intended for the general student.

4A-4B-4C. Elementary Theory (5-5-5) I-II-III. Valente
Lecture—5 hours. Development of writing and listening techniques through the study of music fundamentals; ear-training, beginning tonal counterpoint and harmony; keyboard harmony; score reading; analysis of repertory. Intended primarily for music majors and minors.

5A-5B-5C. Intermediate Theory (4-4-4) I, II, III. Swift
Lecture—4 hours. Prerequisite: course 4C. Intermediate tonal counterpoint and harmony.

10. Introduction to Musical Literature (4) I, Frank, ———; II, Nutter, ———; III, Charles, ———
Lecture—3 hours; listening section—1 hour. An introduction to composers and major styles of Western music. Lectures, listening sections, and selected readings. For non-majors.

24A. Introduction to the History of Music, I (4) I, Holoman
Lecture—3 hours; listening section—1 hour. Prerequisite: course 4A (concurrently). Intended primarily for majors and minors in music. History of music from the late Baroque to the Classical Period.

24B. Introduction to the History of Music, II (4) II. Holoman
Lecture—3 hours; listening section—1 hour. Prerequisite: courses 4A and 24A; course 4B (concurrently). Intended primarily for majors and minors in music. History of music from the Classical Period to the nineteenth century.

24C. Introduction to the History of Music, III (4) III. Holoman
Lecture—3 hours; listening section—1 hour. Prerequisite:

NOTE: For key to footnote symbols, see page 123.

courses 4B and 24B; course 4C (concurrently). Intended primarily for majors and minors in music. History of music from the nineteenth century to the present.

***25A. Introduction to the History of Music, IV** (4) I, Charles
Lecture—3 hours; listening section—1 hour. Prerequisite: courses 4C and 24C; course 5A (concurrently). Intended primarily for majors and minors in music. Historical survey of composers and musical styles from antiquity to around 1400.

***25B. Introduction to the History of Music, V** (4) II. Charles
Lecture—3 hours; listening section—1 hour. Prerequisite: courses 5A and 25A; course 5B (concurrently). Intended primarily for majors and minors in music. Historical survey of vocal music in the early and middle Baroque periods.

***25C. Introduction to the History of Music, VI** (4) III. Charles
Lecture—3 hours; listening section—1 hour. Prerequisite: courses 5B and 25B; course 5C (concurrently). Intended primarily for majors and minors in music. Historical survey of composers and musical styles in the early and middle Baroque periods.

***28. Introduction to Afro-American Music** (4) II. McNeil
Lecture—3 hours; listening and discussion—1 hour. A study of the Afro-American rhythm, field hollers, work song, spirituals, blues, gospel, and jazz; the contrast between West African, Afro-Caribbean, and Afro-Cubanic musical traditions.

29. Music in World Culture (4) III. McNeil
Lecture—3 hours; listening—1 hour. Introduction to the musical repertories of non-Western cultures. Comparative study of selected musical instruments, melodic and rhythmic styles and structures, and the social role of music in non-Western societies.

30. Applied Study of Music Literature: Intermediate (Master Class) (1) I, II, III. The Staff (Holoman in charge)
Performance instruction—1 hour. Prerequisite: open to Music majors with ability to perform scales and short compositions from standard repertory; admission by audition and consent of instructor. Class instruction, arranged by section, in standard orchestral instruments, voice, or organ. This course or the equivalent required for majors in Music; recommended for those preparing for teaching credential in music. May be repeated for credit.

31. Applied Study of Music Literature: Intermediate (Individual) Performance Instruction (2) I, II, III. The Staff (Holoman in charge)
Performance instruction—½ hour; practice—5 hours minimum. Prerequisite: open to Music majors only; admission by audition and consent of instructor. Individual instruction in standard orchestral instruments, voice, or organ. May be repeated for credit.

41. University Symphony (2) I, II, III, Holoman
Rehearsal—4 hours. Prerequisite: admission subject to audition before the first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal, and performance of music from the orchestral literature. May be repeated for credit. (P/NP grading only.)

42. University Chamber Singers (2) I, Neary; II, III, McNeil
Rehearsal—3 hours, plus sectionals—at least 1 hour. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of works for small choral group. May be repeated for credit. (P/NP grading only.)

43. University Concert Band (2) I, II, III. Valente
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band. May be repeated for credit. (P/NP grading only.)

44. University Chorus (2) I, Gomez; II, III, McNeil
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music. May be repeated for credit. (P/NP grading only.)

45. Early Music Ensemble (2) I, II, III, Nutter
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance and Baroque music for vocal ensemble and historical instruments. May be repeated for credit. (P/NP grading only.)

46. Chamber Music Ensemble (1) I, II, III. Bloch in charge
Rehearsal—2 hours; student practice—1 hour. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, voice, piano, harpsichord, and organ. May be repeated for credit. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Holoman in charge)
(P/NP grading only.)

Upper Division Courses

104A-104B-104C. Advanced Theory (4-4-4) I-II-III. Frank
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. Lopez
Laboratory—6 hours. Prerequisite: consent of instructor; limited enrollment with priority to music majors. Composition of electronic music using the Buchia synthesizer. (Only 2 units count toward the music major.)

108A-108B. Orchestration (2-2) I, II. Rosen
Lecture—2 hours. Prerequisite: course 5C. Techniques of orchestration from study of basic instrumental techniques to analysis of orchestral scores and scoring for various instrumental combinations.

110A. The Music of a Major Composer: Beethoven (4) III. Nutter
Lecture—3 hours; listening section—1 hour. The work of Beethoven will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors.

***110B. The Music of a Major Composer: Mahler** (4) II. Frank
Lecture—3 hours; listening section—1 hour. The work of Mahler will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors.

110C. The Music of a Major Composer: Bach (4) I, Bloch
Lecture—3 hours; listening—1 hour. Work of Bach will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors.

110D. The Music of a Major Composer: Mozart (4) II. Frank
Lecture—3 hours; listening—1 hour. Work of Mozart will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors.

111. Choral Conducting (2) II. McNeil
Lecture—2 hours. Prerequisite: course 5C. Study of the principles and techniques of conducting choral ensembles.

***112. Instrumental Conducting** (2) II.
Lecture—2 hours. Prerequisite: course 5C. Principles and techniques of conducting instrumental ensembles.

113A. Music of Non-Western Civilizations (2) I, Charles
Lecture—2 hours; listening—1 hour. Prerequisite: course 25A or former 21A. Study of the native music of Asia. Offered in even-numbered years.

***113B. Music of Non-Western Civilizations** (2) III. McNeil
Lecture—2 hours; listening—1 hour. Prerequisite: course 25A or former 21A. Study of the native music of Africa and the Western Hemisphere. Course 113A is not prerequisite to 113B. Offered in even-numbered years.

121. Topics in Music History and Criticism (4) I, Nutter; II, III, Cairns
Seminar—4 hours (includes selected listening). Prerequisite: courses 5C and 25C. Sources and problems of a historical period or musical style selected by the instuctor and announced in advance. May be repeated for credit.

122. Topics in Analysis and Theory (4) I, Smith; II, Swift; III. Frank
Seminar—4 hours (includes selected listening). Prerequisite: courses 5C and 25C. Analysis of works of a composer or musical style selected by the instructor and announced in advance. Consideration of theoretical issues. May be repeated for credit.

130. Applied Study of Music Literature: Advanced (Master Class) (1) I, II, III. The Staff (Holoman in charge)
Performance instruction—1 hour. Prerequisite: open to Music majors with ability to perform scales and short compositions from standard repertory; admission by audition and consent of instructor. Class instruction, arranged by section, in standard orchestral instruments, voice, or organ. This course or the equivalent required for majors in Music; recommended for those preparing for teaching credential in music. May be repeated for credit.

131. Applied Study of Music Literature: Advanced (Individual) (2) I, II, III. The Staff (Holoman in charge)
Performance instruction—½ hour; practice—5 hours minimum. Prerequisite: open to Music majors only; admission by audition and consent of instructor. Individual instruction in standard orchestral instruments, voice, or organ. May be repeated for credit.

141. University Symphony (2) I, II, III. Holoman
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal and performance of music from the orchestral literature. May be repeated for credit. (P/NP grading only.)

142. University Chamber Singers (2) I, Neary; II, III, McNeil
Rehearsal—3 hours, plus sectionals—at least 1 hour. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of works for small choral group. May be repeated for credit. (P/NP grading only.)

143. University Concert Band (2) I, II, III. Valente
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Rehearsal and performance of music for band. May be repeated for credit. (P/NP grading only.)

144. University Chorus (2) I, Gomez; II, III, McNeil
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music. May be repeated for credit. (P/NP grading only.)

145. Early Music Ensemble (2) I, II, III, Nutter
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance and Baroque music for vocal ensemble and historical instruments. May be repeated for credit. (P/NP grading only.)

146. Chamber Music Ensemble (1) I, II. The Staff (Bloch in charge)
Rehearsal—2 hours; student practice—1 hour. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, voice, piano, harpsichord, and organ. May be repeated for credit. (P/NP grading only.)

190. Senior Seminar in Music (4) I. The Staff (Holoman in charge)
Lecture—4 hours. Prerequisite: courses 5C and 25C, and consent of instructor; course 104C recommended. Intended primarily for majors in music intending to apply for graduate programs in music history, composition, or theory. Review of musical skills, issues in theory and analysis, and the history and literature of music.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Holoman in charge)
(P/NP grading only.)

Graduate Courses

200A-200B. Music Research (4-4) I, Charles; II, Nutter
Seminar—3 hours. Survey of basic materials for music research. Selected projects.

200C. Notation (4) III. Nutter
Seminar—3 hours. Study of selected notation practices.

203A-203B-203C. Composition (4-4-4) A: I, II, III. Swift
Seminar—3 hours. Technical projects and free composition.

240A-240B-240C. Techniques of Analysis (4-4-4) I, Swift; II, Bloch; III, Charles
Seminar—3 hours. Analysis and analytical techniques as applied to music of all historical style periods.

***291A-291B-291C. Topics in Music History** (4-4-4) I-II-III. The Staff
Seminar—3 hours. Studies in selected areas of music history and theory.

299. Individual Study (2-5) I, II, III. The Staff (Holoman in charge)
Special studies and projects in musical composition or music history. (S/U grading only.)

Teaching Methods Courses

300. The Teaching of Music (3) II. Anderson
Lecture—3 hours. Prerequisite: course 1 or the equivalent. Methods of teaching music in grades K-6.

301. The Teaching of Music (3) III. McNeil
Lecture—3 hours. Prerequisite: course 5C (or the equivalent). Methods of teaching music in grades 7-12.

Instrumental Methods. The courses in this series consider methods of teaching orchestra and band instruments, and include repertory and program planning for secondary schools.

321A-321B. Stringed Instruments (1-1) I, Gomez; II, ———, Derthick
Discussion—2 hours. Prerequisite: course 4C.

322. Brass Instruments (1) III. Anderson
Laboratory—2 hours. Prerequisite: course 4C. Offered in odd-numbered years.

***323A-323B. Woodwind Instruments** (1-1) II-III. Anderson
Discussion—2 hours. Prerequisite: course 4C.

NOTE: For key to footnote symbols, see page 123.

324. Percussion Instruments (1) II. Lunetta
Laboratory—2 hours. Prerequisite: course 4C. Considers teaching of percussion instruments. Survey course. Offered in odd-numbered years.

Native American Studies

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Applied Behavioral Sciences.

The Major Program

Native American studies is an introduction to the world of Native people. It is an interdisciplinary approach to area studies, with a focus on North America.

The major in Native American Studies is designed to fulfill two broad purposes. The first is to provide culture-specific training for students likely to work with persons of American Indian background or with Indian communities, or who wish to go on to advanced study in a related field. The second is to provide an introduction to the politics, philosophy, and culture of tribally-organized peoples and small nationalities for those who plan to work overseas or to pursue advanced study involving similarly organized populations.

Native American Studies

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**41-42**
Native American Studies 1	4
Anthropology 2	4
Native American Studies 33†	4
Sociology 1	5
Statistics 13	4
Economics 1A or Agricultural Economics 18	4-5
Environmental Studies 10 or Geography 2	4
History 17A-17B	8
Native American Studies 70	4
Breadth Subject Matter	**44**
Written and oral expression (see College requirement)	8
Humanities (any courses in humanities)	12
Social science (any courses offered in a social science department or ethnic studies program)	12
Natural science	12
Depth Subject Matter	**32**
Native American Studies 130A, 130B	8
Native American Studies 157	4
Two courses from Native American Studies 116, 117, 124	8
One course from Native American Studies 101, 181A, 181B, 181C	4
Anthropology 105A or 106B	4
One course from Anthropology 105B, 143, History 162, 166A, 166B, 169A, 169B	4
Areas of Specialization	**20**
(a) Art area: Native American Studies 101, Art 151, 183C, 183E, 188A	
(b) Education area: Native American Studies 171, Applied Behavioral Sciences 173 or 175, Education 100, 110, 163	
(c) Community Development area: Applied Behavioral Sciences 151, 152, Anthropology 122, 126, Political Science 178 or Applied Behavioral Sciences 154	
(d) Ethnicity area: Applied Behavioral Sciences 172, 176, Anthropology 104, Political Science 126, Sociology 130 (Other areas may be developed by the student in consultation with the major adviser)	
Unrestricted Electives	**42-43**
Total Units for the Major	**180**

†Students may substitute other Native American Studies courses with the approval of the Native American Studies Major Review Committee.

Major Adviser. D. Risling.

Minor Program Requirements:

The Native American studies minor is designed to provide an introduction to the Native experience in North America by means of comprehensive exposure to course-work dealing with the major aspects of Indian life, including history, values, politics, literature, and art.

	UNITS
Native American Studies	**24**
Select one course from each of the following categories	24
Introduction, Native American Studies 1, 10 or 33	
Ethnohistory, Native American Studies 130A, 130B or 130C	
Philosophy and values, Native American Studies 156 or 157	
Politics and current affairs, Native American Studies 116, 117, 118, 124 or 161	
Literature, Native American Studies 181A, 181B or 181C	
Art, Native American Studies 101	

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: 10, 55, 116, 130A, 130B, 130C. (See also page 61.)

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.

10. Native-American Experience (4) I, Adams
Lecture—4 hours. Introduction to American-Indian historical and socio-cultural development with emphasis upon the U.S. area and upon those processes such as relations with non-Indians which have contributed to the current condition of Indian people.

32. Native-American Music and Dance (4) I, Risling
Lecture—3 hours; discussion—1 hour. Introduction to the music and dance of the native peoples of the U.S. Students will study secular native music and dance from a cross-section of regions and tribes. Offered in even-numbered years.

33. Native-American Art in the U.S. (4) I, Longfish
Lecture—4 hours. Comprehensive survey of Indian art forms with emphasis upon design, media, and function. Intent is to familiarize the student with a wide range of styles and techniques of Indian arts in the United States.

34. Native-American Art Workshop (4) I, II, III. Longfish
Lecture—1 hour; laboratory—6 hours; to be arranged—3 hours. Prerequisite: consent of instructor; course 33 recommended. Studio projects in Native-American art, design and crafts. (P/NP grading only.)

***55. Americanisms: Native-American Contributions to World Civilization** (4) III. Hutchison
Lecture—4 hours. Prerequisite: course 1. Analysis and study of Americanisms: traits, inventions, and developments originated in the Americas by native peoples and adopted by other peoples. Offered in odd-numbered years.

70. Native American Perception (4) I, Hutchison
Lecture—4 hours. Prerequisite: course 1. Study of the culturally determined attitudes, visions, values, and relationships of American-Indian people and the differences in perception between Native Americans and the dominant society.

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—4 hours. Prerequisite: course 33. Historical review of contemporary Indian art from 1900 to the present by looking at the two art centers of Oklahoma and Santa Fe. Social pressures that have influenced the imagery that exists today will be examined. Offered in odd-numbered years.

***112. History and Culture of the "Five Civilized Tribes"** (4) III. Hutchison
Lecture—4 hours. Prerequisite: upper division standing; course 1. History and culture of the Native American people, found in southeastern part of the U.S., called the "Five Civilized Tribes." Offered in odd-numbered years.

116. Native-American Traditional Governments (4) II. Risling
Lecture—4 hours. Prerequisite: course 1; Anthropology 2. Study of selected Native-American Tribal Governments, confederations, leagues, and alliance systems. Offered in even-numbered years.

117. Native-American Governmental Decision Making (4) III. Risling
Lecture—4 hours. Prerequisite: course 116, Political Science 2; Anthropology 123 recommended. Native-American governmental and community decision making with emphasis on federal and state programs, tribal sovereignty, current political trends and funding for tribal services. Offered in odd-numbered years.

***118. Native-American Politics** (4) II. Risling
Lecture—4 hours. Prerequisite: course 117. Examination of the various interest groups and movements found among native people and how they relate to the determination of Indian affairs. Study of political action available to native groups, and local communities, along with relevant theory relating to underdevelopment. Offered in even-numbered years.

***124. Contemporary Affairs of Native Americans in California** (4) III. Risling
Lecture—4 hours. Prerequisite: course 1; Anthropology 106C recommended. Study of the contemporary problems, issues, and developments involving Native Americans, both urban and rural, in California. Offered in odd-numbered years.

***130A. Native-American Ethno-Historical Development** (4) I, Forbes
Lecture—4 hours. Prerequisite: course 1; History 17A-17B recommended. Study of Native-American Ethno-History in North America before 1770's. Offered in even-numbered years.

***130B. Native-American Ethno-Historical Development** (4) II. Forbes
Lecture—4 hours. Prerequisite: course 1; History 17A-17B recommended. Study of Native-American Ethno-History in North America, 1770-1890. Offered in odd-numbered years.

130C. Native-American Ethno-Historical Development (4) I, Forbes
Lecture—4 hours. Prerequisite: course 1; History 17A-17B recommended. Study of Native-American Ethno-History in North America after 1890. Offered in odd-numbered years.

156. Native-American Ethics and Value Systems (4) II. Hutchison
Lecture—4 hours. Prerequisite: upper division standing; course 1. Analysis of Native-American systems of values and how these values translate into actual behavior; attention to the problem of implementing traditional values in the twentieth century and the possible impact of native values in modern societies. Offered in odd-numbered years.

157. Native-American Religion and Philosophy (4) III. Forbes
Lecture—4 hours. Prerequisite: upper division standing; course 1 or Anthropology 2. Religious and philosophical thinking of Native-American people with emphasis upon North America. Offered in odd-numbered years.

161. Native-American Community Development (4) III. Adams
Lecture—4 hours. Prerequisite: course 1; Applied Behavioral Sciences 19 or 151. 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. Offered in odd-numbered years.

***171. Counseling the Native American** (4) II. Hutchison
Lecture—4 hours. Prerequisite: Education 163 and one course in psychology or human development; course 70 recommended. Theory and practice of counseling to reveal the subjective, cultural and interfering differences between Native Americans and the dominant culture.

180. Native-American Women (4) III. Hutchison
Lecture—4 hours. Prerequisite: upper division standing; course 70 and Women's Studies 50 recommended. Social and cultural foundations of the Native-American woman's personality including the development of the Indian girl and the life phases of mature womanhood. Autobiographical and biographical texts will be utilized.

NOTE: For key to footnote symbols, see page 123.

181A-181B-181C. Native-American Literature (4) I-II-III. Hutchison
Lecture—4 hours. Prerequisite: course 1 and one course from English 1, 2, or 3. Analysis of works by or about Native Americans including novels and autobiographies, analysis of Native-American poetry, oral literature, songs, and tales. (A), the novel and fiction; (B), nonfiction works by native authors; (C), traditional literature and poetry. Offered in 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
Field work—36 hours. Prerequisite: senior standing and major in Native American Studies, completion of lower division major requirements, and course 161. Field work with governmental and community groups, under supervision of faculty adviser and sponsor. Knowledge acquired in other courses to be applied in field work. (P/NP grading only.)

196. Senior Project in Native American Studies (4) I, II, III. Risling in charge
Student/faculty consultation—4 hours. Prerequisite: senior standing and major in Native American Studies, course 195 (may be taken concurrently), and consent of instructor. Guided research project that enables student to apply the theory and research principles from major course work. Final product is to be a major senior project or thesis.

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)

David R. Viglierchio, Ph.D., Chairperson of the Division

Division Office, 488 Hutchison Hall (752-1403)

Faculty

Steven M. Brown, Ph.D., Visiting Assistant Professor
Harry K. Kaya, Ph.D., Associate Professor
Benjamin F. Lownsbery, Ph.D., Professor Emeritus
Armand R. Maggenti, Ph.D., Lecturer
Dewey J. Raski, Ph.D., Professor
David R. Viglierchio, Ph.D., Lecturer

Related Major Program. See the major in Entomology (page 203).

Graduate Study. Graduate degrees specializing in Nematology are offered through the Department of Entomology or the Department of Plant Pathology.

Courses in Nematology

Upper Division Courses

100. General Plant Nematology (4) I. Brown
Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1 or 10; lower division students with consent of instructor only. An introduction to the classification, morphology, biology, and control of the nematodes attacking cultivated crops.

110. Introduction to Nematology (2) II. Maggenti
Lecture—2 hours. Prerequisite: Zoology 2 or the equivalent or consent of instructor. The relationship of nematodes to man's environment. Classification, morphology, ecology, distribution, and importance of nematodes occurring in water and soil as parasites of plants and animals.

120. Nematode Behavior (2) III. Viglierchio
Lecture—2 hours. Prerequisite: course 100 or 110. Behavior characteristics of nematodes promoting their impact upon plants, animals and micro-organisms including responses to natural and artificial changes in environment. Offered in even-numbered years.

121. Nematode Biology (2) III. Viglierchio
Lecture—2 hours. Prerequisite: course 100 or 110. Life processes in nematodes describing functions, mechanisms and processes for coping with environment for survival and sustaining nematode aggressiveness. Offered in odd-numbered years.

130. Principles of Nematode Control (4) III. The Staff
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100; Chemistry 8B and Statistics 13 recommended. Principles and techniques used for derivation of data and their interpretation as the basis for control of plant parasitic nematodes. The biological, physical, and chemical factors influencing nematodes and their control are studied in laboratory and greenhouse. Some field trips required.

Graduate Courses

***220. Principles and Techniques of Nematode Taxonomy and Morphology** (4) III. Raski
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100. Analysis and evaluation of the techniques used in the collection, extraction, and preparation of specimens, freehand and histologic sections; presentation of illustrative material. Offered in odd-numbered years.

***222. Nematode Pathogenicity to Plants** (3) II. The Staff
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 100. Investigations of problems in proving nematode pathogenicity; the role of nematodes in plant diseases. Offered in odd-numbered years.

***225. Nematode Taxonomy and Comparative Morphology** (5) II. Maggenti
Lecture—2 hours; laboratory—6 hours; 3 hours of laboratory to be announced. Prerequisite: course 220. The Taxonomy, morphology, and comparative morphology of soil, freshwater, and marine nematodes as well as select plant and animal parasites. Offered in even-numbered years.

240. Nematodes of Invertebrates (2) I, Kaya
Lecture—1 hour; discussion—1 hour. Prerequisites: Entomology 100 and course 110; undergraduate and graduate student standing. Study the relationships between nematodes and invertebrates with emphasis on insects. Bionomics and biological control potential of nematodes of invertebrates, selected invertebrates as intermediate hosts for nematode parasites of animals, and as phoretic hosts for nematode parasites of plants. Offered in even numbered years.

290. Seminar (1) II. The Staff (Chairperson in charge)
Seminar—1 hour. Selected aspects of general nematology. Topics vary from year to year.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Selected topics in Nematology. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Neurology

See Medicine

Neurosurgery

See Medicine

Nutrition

See below, and the Graduate Group (page 276); and also Nutrition Science

Nutrition

(College of Agricultural and Environmental Sciences)

[1]Robert B. Rucker, Ph.D., Chairperson of the Department
————, Acting Chairperson of the Department

Department Office, 129 Everson Hall (752-6650)

Faculty

Nemat O. Borhani, M.D., Professor *(Community Health)*
Andrew J. Clifford, Ph.D., Professor
Kathryn G. Dewey, Ph.D., Assistant Professor
Madeline F. Ferrell, Ph.D., Assistant Professor
Louis E. Grivetti, Ph.D., Associate Professor *(Nutrition, Geography)*
Fredric W. Hill, Ph.D., Professor
[2]Lucille S. Hurley, Ph.D., Professor
Carl L. Keen, Ph.D., Assistant Professor
Bo L. Lonnerdal, Ph.D., Associate Professor
Jo Ann Prophet, M.S., Visiting Lecturer
[1]Robert B. Rucker, Ph.D., Professor *(Nutrition, Biological Chemistry)*
Barbara O. Schneeman, Ph.D., Associate Professor *(Nutrition, Food Science and Technology)*
Judith S. Stern, Sc.D., Professor
Helene Swenerton, Ph.D., Lecturer
William C. Weir, Ph.D., Professor
Frances J. Zeman, Ph.D., Professor

Related Major Programs. See the majors in Community Nutrition (page 161), Dietetics (page 168), and Nutrition Science (page 276).

Minor Program Requirements:

The Department of Nutrition offers four minor programs open to students majoring in other disciplines who wish to complement their study programs with a concentration in the area of food and nutrition.

Note: If the student's major program requires the same course in biochemistry and physiology, only one of the courses may duplicate credit toward the minor. Each program below lists replacement courses to fulfill the minimum unit requirement.

	UNITS
Community Nutrition	**25**
Preparation: plan in advance to include the required course prerequisites.	
Nutrition 101 or 110, plus 111	9
Nutrition 118, 119	7
Nutrition 120	4
Physiology 110	5
Replacement courses (see note above): Nutrition 111, 114, 116A-116B, 116AL-116BL.	

	UNITS
Food Service Management	**24-25**
Preparation: plan in advance to include the required course prerequisites.	
Food Science and Technology 100A-100B, 101A-101B	10
Food Service Management 120, 120L, 121, 122	11
Food Service Management 123 or Agricultural Economics 112	3-4
Replacement courses (see note above): Nutrition 10, 101, 110, 111, 114, 116A-116B, Economics 11A-11B.	

	UNITS
Nutrition and Food	**24**
Preparation: plan in advance to include the required course prerequisites.	
Nutrition 101, 111	9
Nutrition 120	4
Food Science and Technology 100A, 100B	6
Physiology 110	5
Replacement courses (see note above): Nutrition 111, 114, 116A-116B, 116AL-116BL.	

	UNITS
Nutrition Science	**20-21**
Preparation: plan in advance to include the required course prerequisites.	
Biochemistry 101A-101B or Physiological Sciences 101A-101B	6-7
Physiology 110	5
Nutrition 110, 111	9
Replacement courses (see note above): Nutrition 114, 116A-116B, 117.	

NOTE: For key to footnote symbols, see page 123.

Minor Adviser. R.B. Rucker.

Graduate Study. Programs of study leading to the M.S. and Ph.D. degrees are available in Nutrition. For information on graduate study contact the graduate adviser.

Courses in Nutrition

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.

11. Current Topics and Controversies in Nutrition (1) II, III. Hill
Discussion—1 hour; term paper. Prerequisite: course 10 (may be taken concurrently). Assigned readings and discussion of topics of current concern and broad interest in contemporary nutrition. Coordinated with course 10. Not open for credit to students who have taken an upper division course in nutrition. Limited enrollment. (P/NP grading only.)

20. Food and Culture: An Introduction to Culture, Diet, and Cuisine (4) III. Grivetti
Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2, Geography 2, and Nutrition 10 recommended. Historical and contemporary overview of culture, food habits, and diet; exploration of the major themes in food habit research; minority food habits; origins and development of dietary practices. (Same course as Food Science and Technology 20.)

93. Public Issues in Nutrition and Food Science (1) II. Ferrell, Schweigert (Food Science and Technology)
Seminar—1 hour. Faculty and invited guest speakers will present topics in the area of nutrition and food science which are currently subjects of public debate. Intended as an introduction to Nutrition and Food Science for students new to the campus. (P/NP grading only.) (Same course as Food Science and Technology 93.)

99. Individual Study for Undergraduates (1-5) I, II, III. The Staff
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, Lonnerdal
Lecture—5 hours. Prerequisite: Chemistry 8B; Physiology 110 or 2. An introduction to the metabolism of protein, fat, and carbohydrate; the role of vitamins and minerals; food utilization. Not open for credit to students who have taken courses 110 or 111.

103. Animal Nutrition and Feeding (4) I, Garrett (Animal Science)
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 8B. The basic principles of animal nutrition as they are applied to livestock feeding; the composition and uses of feedstuffs in their relation to the feeding of farm animals and poultry; the balancing of rations.

110. Principles of Nutrition (5) II, *III. Calvert (Animal Science)
Lecture—5 hours. Prerequisite: Physiological Sciences 101B (preferred) or Biochemistry 101B; a course in physiology or zoology. Fundamental principles of the nutrition of man and other animals. Physiological basis of nutrient requirements for growth, maintenance and production. Physiological basis of nutritional disorders.

111. Human Nutrition (4) III. Ferrell, Keen
Lecture—3 hours; discussion—1 hour.Prerequisite: course 101 or 110. Nutrition of humans; critical study of nutrient requirements at various phases of life cycle.

111L. Nutrition Laboratory (1) II, III. Ferrell
Laboratory—3 hours. Prerequisite: course 110 or 101. Laboratory study of the chemical and physiological roles of nutrients in metabolism; use of experimental animals in determining the essentiality and function of nutrients.

112. Nutritional Considerations of Food Processing (3) III. Schneeman
Lecture—3 hours. Prerequisite: Biochemistry 101A-101B or understanding of the biochemical function of nutrients. The metabolism and availability of nutrients from foods. The effect of food processing techniques on the retention of nutrients in foods. Students having had course 102 or 110 may receive only 2 units of credit for this course.

114. Developmental Nutrition (4) II. Hurley, Keen
Lecture—4 hours. Prerequisite: course 110 or 101; course 111. Role of nutritional factors in embryonic and postnatal development.

116A-116B. Diet Therapy (3-3) I-II. Zeman, Clifford, Stern
Lecture—3 hours. Prerequisite: course 111; Physiology 110 (or the equivalent). Biochemical and physiological bases for therapeutic diets. Problems in planning diets for normal and pathological conditions.

116AL. Practicum in Diet Therapy (2) I, Zeman
Lecture—1 hour; Laboratory—2 hours; extensive written assignments. Prerequisite: course 116A (may be taken concurrently). Planning and evaluation of therapeutic diets; procedures in patient education. Coordinated with course 116A. (Deferred grading only pending completion of 116AL-116BL sequence.)

116BL. Practicum in Diet Therapy (1) II. The Staff (Zeman in charge)
Lecture—4 hour; laboratory—14 hours; extensive written assignments. Prerequisite: course 116B (may be taken concurrently); 116AL. Planning and evaluation of therapeutic diets; procedures in patient education. Coordinated with course 116B. Continuation of course 116AL. (Deferred grading only pending completion of 116AL-116BL sequence.)

117. Experimental Nutrition (5) I, Clifford
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 111; 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. Dewey, Ferrell
Lecture—3 hours. Prerequisite: course 101 or 111; course 116A recommended. Nutrition problems in contemporary communities in the U.S. and in developing countries. Nutrition programs and policy, principles of nutrition education.

119. Field Work in Community Nutrition (4) III. Dewey, Grivetti
Lecture—2 hours; field work—6 hours. Prerequisite: course 118 and consent of instructor. Introduction to field work in community nutrition involving nutrition education, nutrition counseling, or community nutrition research.

120. Food Habits and their Nutritional Implications (4) III. Grivetti
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division or graduate standing; upper division course in nutrition or Biochemistry 101B; course 20 recommended. Advanced themes exploring food habits and their nutritional implications; pica; toxicants naturally occurring in food; ethnic diet; food systems; dietary codes; overview and case histories.

121. Technical Animal Nutrition (2) II. Heitman (Animal Science)
Lecture—2 hours. Prerequisite: course 110. The application of the principles of nutrition to the feeding of livestock. Evaluation of the nutrient content and feeding value of feedstuffs and formulated rations. Feeding standards and nutrient requirements for physiological functions. Ration formulation; least cost rations.

122. Ruminant Nutrition and Digestive Physiology (3) III. Morris (Animal Science)
Lecture—3 hours. Prerequisite: Physiology 110; Biochemistry 101A-101B or Physiological Sciences 101A-101B; Bacteriology 2 recommended. Study of nutrient utilization as influenced by the unique aspects of digestion and fermentation in the ruminant.

122L. Ruminant Nutrition Laboratory (2) III. Macy and Morris (Animal Science)
Laboratory—6 hours. Prerequisite: course 122 (concurrently). Students will conduct experiments in small groups and attend demonstrations on topics peculiar to ruminant digestive physiology and nutrition. The laboratory will deal with topics developed in lectures.

123. Nutrition of Non-Ruminant Animals (3) III. ——— (Avian Sciences), ——— (Animal Science)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 103 or course 110. Application of nutrition principles to the feeding of non-ruminant species, including swine, poultry and laboratory animals.

124. Nutrition and Feeding of Finfish and Shellfish (3) III. Hung and Conklin (Animal Science)
Lecture—2 hours; discussion—1 hour. Prerequisite: course 103 or 110 or Avian Sciences 150. Application of principles of nutrition to feeding of finfish and shellfish; feeding habits, gastrointestinal anatomy, digestive physiology, aquatic environment, nutrient requirements, diet formulation and quality control, and feeding practices of commercially cultured fish.

129. Journalistic Practicum in Nutrition (2) II. Stern, Swenerton
Discussion—2 hours. Prerequisite: courses 111; a course in written or oral expression or consent of instructor. Critical analysis and discussion of current, controversial issues in nutrition; the use of journalistic techniques to interpret scientific findings for the lay public. Students will be required to write several articles for campus media. Course may be repeated once for credit. Offered in odd-numbered years.

190. Proseminar in Nutrition (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: senior standing; course 111. Discussion of human nutrition problems. Each term will involve a different emphasis among experimental, clinical, and dietetic problems of community, national and international scope. May be repeated for credit with consent of instructor. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff
Laboratory—3-36 hours. Prerequisite: one upper division course in Nutrition and consent of instructor. Work experience on or off campus in practical application of nutrition, supervised by a faculty member. (P/NP grading only.)

197T. Tutoring in Nutrition (1-2) I, II, III. The Staff
Discussion-laboratory—3 or 6 hours. Prerequisite: Nutrition, Dietetics, Community Nutrition or related major. Completion of course 101 or 110 with B grade or better. Tutoring of students in nutrition courses, assistance with discussion groups or laboratory sections, weekly conference with instructor in charge of course: written evaluations. May be repeated if tutoring a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Rucker in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Rucker in charge)
(P/NP grading only.)

Graduate Courses

201. Vitamin Metabolism (2) I, Rucker
Lecture—2 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry 101A-101B or Physiological Sciences 101A-101B, and Physiology 110. Review of studies and relationships involving the metabolic functions of vitamins. Comparative nutritional aspects and the metabloism and chemistry of vitamins and vitamin-like compounds emphasized.

202. Advanced Animal Energetics and Energy Metabolism (4) II. The Staff (Baldwin, Animal Science, in charge)
Lecture—4 hours. Prerequisite: course 110, Biochemistry/Physiological Sciences 101B, Physiology 110. History of nutritional energetics; evaluation of energy transformations associated with food utilization; energy expenditures at cellular, tissue and animal levels as affected by diet and physiological state; appetite regulation; obesity, lipid transport and metabolism.

203. Advanced Protein and Amino Acid Nutrition (4) III. The Staff (Rogers, Physiological Sciences, in charge)
Lecture—4 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry/Physiological Sciences 101B, Physiology 110. Nutritional significance of protein and amino acids, including studies of the influence of dietary protein on digestion, absorption, metabolism, resistance to disease and food intake. Study of dietary requirements and interrelationships among amino acids.

204. Mineral Metabolism (2) III. Lonnerdal
Lecture—2 hours. Prerequisite: course 110, Bacteriology 2, Biochemistry 101A-101B or Physiological Sciences 101A-101B, and Physiology 110. Studies of metabolic functions and nutritional interrelationships involving minerals.

212. Design and Evaluation of Nutrition Education Programs (2) I.
Lecture—2 hours. Prerequisite: graduate standing in nutrition. Skills and techniques of planning and evaluating nutrition programs. Emphasis on nutrition education; curricula, instructional strategies and evaluation methods in formal classroom and informal community settings. Intended for students preparing to administer programs or teach in universities or dietetic internships.

216. Advanced Diet Therapy (3) III. Zeman
Lecture—3 hours. Prerequisite: course 116A-116B. Nutrition and disease interrelationships at cellular, tissue and whole body levels with emphasis on human disease. Critical evaluation of methodology in the study of nutrition in disease states.

218. Advanced Field Work in Community Nutrition (2-12) I, II, III, extra session summer. The Staff (Zeman in charge)
Discussion—1 hour; field work. Prerequisite: courses 118, 119; graduate standing; consent of instructor. Directed experience in community nutrition. Organization and implementation of nutrition programs.

219. International Nutrition (3) III. Dewey
Lecture—3 hours. Prerequisite: an upper division course in nutrition and consent of instructor; course 118 recommended. Prevalence and etiology of malnutrition worldwide, with emphasis on maternal and child health; efficacy of nutrition interventions and food aid; consideration of the complex relationships between economic development, povery and nutrition, and options for nutrition policy and planning.

251. Single Carbon Metabolism in Nutrition (2) I, Vohra (Avian Sciences)
Lecture—2 hours. Prerequisite: course 203. Nutritional and

NOTE: For key to footnote symbols, see page 123.

metabolical interrelationships involved in the transfer of single carbon units in various animals; the involvement of the metabolical function of biotin, folic acid, vitamin B_{12} pyridoxine, choline, methionine and other nutrients. Offered in odd-numbered years.

252. Nutrition and Development (3) II. Hurley, Keen
Lecture—3 hours. Prerequisite: courses 201, 202, 203. Relationship of nutrition to prenatal and early postnatal development. Offered in even-numbered years.

253. Control of Food Intake (3) III. Rogers (Physiological Sciences), Mendel (Animal Science), Stern
Lecture—2 hours; discussion—1 hour; 2 or 3 laboratory demonstrations per quarter. Prerequisite: courses 201, 202 or Physiology 210B or consent of instructor. Comprehensive study of the biochemical, nutritional, behavioral, and physiological mechanisms controlling food intake. Subject matter will be approached through lectures, laboratory demonstration and discussions where students and staff will critically evaluate the literature. Offered in even-numbered years.

254. Ruminant Digestion and Metabolism (3) I, Morris and Baldwin (Animal Science)
Lecture—3 hours. Prerequisite: courses 122, 201, 202, 203 recommended. Qualitative and quantitative aspects of ruminant digestive and metabolic processes; nutrient requirements; rumen microbiology and biochemistry; digestive physiology; nutrient absorption; patterns, rates and mechanisms of nutrient utilization; regulatory processes. Offered in even-numbered years.

***255. Natural Toxicants in Foods** (2) II. Vohra (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.

290. Beginning Nutrition Seminar (1) I, II, III. The Staff (Vohra, 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.

290C. Research Conference (1) I, II, III. The Staff (Rucker in charge)
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Major professors lead research discussions with their graduate students. Research papers are reviewed and project proposals presented and evaluated. Format will combine seminar and discussion style. (S/U grading only.)

291. Advanced Nutrition Seminar (1) I, II, III. The Staff (Grivetti in charge)
Seminar—1 hour. Prerequisite: second-year graduate standing. Discussion and critical evaluation of advanced topics in nutrition research. (S/U grading only.)

297T. Supervised Teaching in Nutrition (1-3) I, II, III. Rucker in charge
Teaching under faculty supervision—3-9 hours. Prerequisite: graduate status in nutrition or consent of instructor. Practical experience in teaching nutrition at the university level; curriculum design and evaluation; preparation and presentation of material. Assistance in laboratories, discussion sections, and evaluation of student work. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Course

380. Supervised Teaching in Dietetics (2-12) I, II, III, extra-session summer. The Staff
Laboratory—6-36 hours. Prerequisite: graduate standing in M.S. program in Nutrition with emphasis in dietetics; consent of instructor. Directed teaching in approved dietetic internships or coordinated program in dietetics. May be repeated for a total of 12 units; 3 units may be counted toward degree credit.

Nutrition (A Graduate Group)

Louis E. Grivetti, Ph.D., Chairperson of the Group

Group Office, 129 Everson Hall (752-6650)

Graduate Study. The Graduate Group in Nutrition offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information regarding these programs, address the chairperson of the group.

Graduate Advisers. Consult the Nutrition Graduate Group Office.

Nutrition Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Nutrition Science major provides organized study in nutrition and relevant biological and physical sciences as preparation for (1) graduate study in nutrition, including the nutrition of species or groups, such as human, domestic animal, avian and wildlife; (2) professional study of medicine, veterinary medicine, public health, dietetics,† and other health sciences; (3) technical work in nutrition in animal, food, and pharmaceutical industries; (4) technical writing; and (5) health education. You should consult with your adviser with respect to additional courses appropriate to your specific interest.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**52-53**
Biochemistry (Physiological Sciences 101A, 101B or Biochemistry 101A, 101B)	6-7
Biology with laboratory (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A, 1B, 1C, 5, 8A, 8B)	25
Microbiology with laboratory (Bacteriology 2, 3)	4
Statistics (Statistics 13 or Agricultural Science and Management 150)	4
Written or oral expression (see College requirement)	8
Depth Subject Matter (Select from Nutrition 110, 111, 111L, 114, 116A, 116B, 117, 121, 122, 123, 190, 198, and 199.)	**20**
Breadth Subject Matter (Courses in social sciences and humanities.)	**20**
Restricted Electives	**46-48**
Biochemistry laboratory (Biochemistry 101L)	5
Calculus or physics (excluding Physics 10)	6
Foods and food science	6
Physiology with laboratory (Physiology 110, 110L, plus an additional physiology course)	10
Additional nutrition or related biological and physical sciences	19-21
Unrestricted Electives	**39-42**
Total Units for the Major	**180**

Major Adviser. B. L. Lonnerdal.

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 94.

Graduate Adviser. See *Class Schedule and Room Directory.*

†To fulfill the academic requirements for an internship in Dietetics, choose the following courses from the categories in which they appear above: English 1, Psychology 1, Sociology 1 or 3 or Anthropology 2, Economics 1B, Food Science and Technology 100A, 100B, Nutrition 110, 111, 111L, 116A, 116B. The following courses must be added: Agricultural Economics 112; Food Science and Technology 101A, 101B; Food Service Management 120, 120L, 121, 122, 123; Applied Behavioral Sciences 173 or Education 110. Students intending to apply for admission to a dietetic internship must contact the Master Adviser in Dietetics no later than the first quarter of the junior year for information on procedures.

Oriental Languages and Civilizations

(College of Letters and Science)

Department Office (Anthropology), 328 Young Hall (752-0745)

Faculty

[2,3]Donald Gibbs, Ph.D., Associate Professor
Jong S. Kim, B.A., Adjunct Lecturer
Key H. Kim, Ph.D., Associate Professor
Janet S. Shibamoto, Ph.D., Assistant Professor
Michio Tsutsui, Ph.D., Visiting Assistant Professor
Benjamin E. Wallacker, Ph.D., Professor
Yun-Chen Li, M.A., Visiting Lecturer

Related Courses. See East Asian Studies course listing.

Minor Program. Available through consultation with an undergraduate adviser in Oriental Languages and Civilizations.

Courses in Chinese

See Asian American Studies for courses in Cantonese language.

Lower Division Courses

1-2-3. Elementary Modern Chinese (6-6-6) I-II-III. Li
Lecture—3 hours; recitation—3 hours. (Students who have successfully completed Chinese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

4. Intermediate Modern Chinese (4) I. The Staff
Lecture—3 hours; recitation—2 hours. Prerequisite: course 3 or consent of instructor. Continuation of course 3.

5. Intermediate Modern Chinese (4) II. The Staff
Lecture—3 hours; recitation—2 hours. Prerequisite: course 4 or consent of instructor. Shift gradually made to written material drawn from contemporary sources in China, including short stories and plays. Equal emphasis on speaking, reading and writing. Traditional, long form character forms introduced.

6. Intermediate Modern Chinese (4) III. Gibbs
Lecture—3 hours; recitation—2 hours. Prerequisite: course 5 or consent of instructor. Reading and discussion of a contemporary movie script, followed by study of the film itself. Other work includes translation, oral review of all grammatical patterns, and reading of two short stories.

Upper Division Courses

101. Classical Chinese (4) I, II, III. Wallacker
Lecture—3 hours; term paper. Prerequisite: course 6. Readings in selected texts. May be repeated twice for credit. To be given if a sufficient number of students enroll.

111. Modern Chinese Literature: Reading and Discussion (4) I, II, III. Gibbs
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or the equivalent. Short stories, newspaper articles, essays. May be repeated twice for credit.

NOTE: For key to footnote symbols, see page 123.

Courses in Japanese

Lower Division Courses

1-2-3. Elementary Modern Japanese (6-6-6) I-II-III. J. Kim
Lecture—3 hours; recitation—3 hours. (Students who have successfully completed Japanese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

4. Intermediate Modern Japanese (4) I, Tsutsui
Lecture—3 hours; recitation—2 hours. Prerequisite: course 3 or the equivalent. First of three sequential courses in intermediate modern Japanese and places equal emphasis on reading, speaking, and writing. Approximately 200 new *kanji* will be introduced, in addition to those taught in courses 1, 2, and 3.

5. Intermediate Modern Japanese (4) II. Tsutsui
Lecture—3 hours; recitation—2 hours. Prerequisite: course 4 or the equivalent. Second of three sequential courses in intermediate modern Japanese and places equal emphasis on reading, speaking, and writing. Approximately 200 new *kanji* will be introduced, in addition to those taught in courses 1 through 4.

6. Intermediate Modern Japanese (4) III. Tsutsui
Lecture—3 hours; recitation—2 hours. Prerequisite: course 5 or the equivalent. Third of three sequential courses in intermediate modern Japanese and places equal emphasis on reading, speaking, and writing. Approximately 200 new *kanji* will be introduced, in addition to those taught in courses 1 through 5.

Upper Division Courses

***101. Literary-Style Japanese** (2) II. K. Kim
Lecture—14 hours; term paper. Prerequisite: course 121. Readings from selected pre-World War II Japanese texts in the *bungobun* style. May be repeated for credit.

***111. Japanese Composition** (2) I, Shibamoto
Lecture—2 hours; term paper. Prerequisite: course 6 or consent of instructor. Development of skills in the techniques of writing Japanese. Practice in short essay writing with an aim toward mastery of the vocabulary and syntax of written style Japanese.

121. Modern Japanese: Reading and Discussion (4) I, ——
Lecture—3 hours; discussion—1 hour. Prerequisite: course 6. Readings in modern Japanese short stories, newspaper articles, and essays, based on reading skills developed in courses 1 through 6. Television programs selected to coordinate with readings will be used to provide practice relating language to social situations.

122. Modern Japanese: Reading and Discussion (4) II. Shibamoto
Lecture—3 hours; discussion—1 hour. Prerequisite: course 121. Readings in modern Japanese short stories, newspaper articles, and essays, based on reading skills developed in courses 1 through 121. Television programs selected to coordinate with readings will be used to provide practice relating language to social situations.

123. Modern Japanese: Reading and Discussion (4) III. Shibamoto
Lecture—3 hours; discussion—1 hour. Prerequisite: course 122. Readings in modern Japanese short stories, newspaper articles and essays, based on reading skills developed in courses 1 through 122. Television programs selected to coordinate with readings will be used to provide practice relating language to social situations.

Courses in Oriental Languages and Civilizations

Lower Division Courses

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Languages of Eastern Asia (4) II. Wallacker
Lecture—3 hours; oral reports. Prerequisite: Anthropology 110 (may be taken concurrently) or the equivalent. Survey of languages and language families of Eastern Asia, their natures and distributions.

197T. Tutoring in Oriental Languages (1-5) I, II, III. The Staff (Wallacker in charge)
Tutorial—1-5 hours. Prerequisite: consent of Department Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

***201. Proseminar in Sinological Methods** (4) III. Wallacker
Seminar—3 hours. Prerequisite: knowledge of classical Chinese.

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Orientation

(College of Agricultural and Environmental Sciences)

Course in Orientation

Questions pertaining to the following course should be directed to the instructor or to the Biochemistry Department, 149 Briggs Hall.

Lower Division Course

1. Orientation (no credit) I, II, III. Chaykin (Biochemistry and Biophysics)
Discussion. Exploration of the philosophy, purposes, significance, expectations and mechanisms of university education. (P/NP grading only.)

Orthopaedic Surgery

See Medicine

Otorhinolaryngology

See Medicine

Pathology

Veterinary Medicine, this page; Medicine, see page 263.

Pathology

(School of Veterinary Medicine)

Donald L. Dungworth, B.V.Sc., Ph.D., Chairperson of the Department

Department Office, 1126 Haring Hall (752-1385)

Faculty

Donald R. Cordy, D.V.M., Ph.D., Professor Emeritus
Donald L. Dungworth, B.V.Sc., Ph.D., Professor
Robert J. Higgins, B.V.Sc., M.Sc., Ph.D., Assistant Professor
Charles A. Holmberg, D.V.M., Ph.D., Associate Professor
Peter C. Kennedy, D.V.M., Ph.D., Professor
Linda J. Lowenstine, D.V.M., Ph.D., Assistant Professor
Peter F. Moore, B.V.Sc., Ph.D., Assistant Professor
Jack E. Moulton, D.V.M., Ph.D., Professor
Harvey J. Olander, D.V.M., Ph.D., Professor
Bennie I. Osburn, D.V.M., Ph.D., Professor
Roy R. Pool, Jr., D.V.M., Ph.D., Professor
Anthony A. Stannard, D.V.M., Ph.D., Professor *(Pathology, Medicine)*
Dennis W. Wilson, D.V.M., M.S., Ph.D., Assistant Professor

Courses in Pathology

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

281. Tropical Diseases of Livestock (3) III. Moulton, Howarth
Lecture—3 hours. Prerequisite: Veterinary Medicine 452 or (Medical) Pathology 210 or the equivalent (may be taken concurrently). Open to graduate or veterinary medical students. Epidemiologic and pathologic processes associated with diseases usually foreign to the United States and of major importance in tropical countries. (S/U grading only.)

282. Tumor Pathology (3) II. Moulton, Dungworth
Lecture—3 hours. Prerequisite: graduate student standing or final year veterinary student and consent of instructor. The histogenesis, incidence, geographical distribution, etiology, transmission, immunity, host response, gross and microscopic structure, and metastasis of the neoplasms of domestic animals. Offered in even-numbered years.

286A. Selected Topics in Advanced Special Pathology (3) I. The Staff (Dungworth in charge)
Lecture—3 hours. Prerequisite: graduate standing or final year veterinary medical student; consent of instructor. Patterns of reaction to injury of selected organ systems and differentiating morphologic characteristics of their major disease entities. Emphasis will be on pathogenetic mechanisms and cellular)subcellular pathology involved in inflammation, pulmonary disease, renal disease, and avian disease. Offered in even-numbered years.

286B. Selected Topics in Advanced Special Pathology (3) II. The Staff (Dungworth in charge)
Lecture—3 hours. Prerequisite: graduate student or fourth year veterinary medical student; consent of instructor. Patterns of reaction to injury of selected organ systems and differentiating morphologic characteristics of their major disease entities. Emphasis will be on pathogenetic mechanisms and cellular/subcellular pathology of the musculoskeletal, ophthalmic and gastrointestinal systems and immunopathology. Offered in odd-numbered years.

286C. Selected Topics in Advanced Special Pathology (3) III. The Staff (Dungworth in charge)
Lecture—3 hours. Prerequisite: graduate standing or fourth year veterinary medical student; consent of instructor. Patterns of reaction to injury of selected organ systems and differentiating morphologic characteristics of their major disease entities. Emphasis will be on pathogenetic mechanisms and cellular/subcellular pathology of the skin, nervous system, and reproductive system. Offered in odd-numbered years.

290. Seminar in Veterinary Pathology (1) I, II, III. The Staff
Seminar—1 hour. (S/U grading only.)

291. Histopathology Conference (1) I, II, III. The Staff (Olander 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
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 (Olander 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. Lowenstine
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.)

NOTE: For key to footnote symbols, see page 123.

298. Group Study (1-5) I, II, III. The Staff
Group Study of advanced topics in pathology. (S/U grading only.)

299. Research in Veterinary Pathology (1-12) I, II, III. The Staff
(S/U grading only.)

Pediatrics

See Medicine

Pharmacology

See Medicine

Pharmacology and Toxicology

Graduate Group (see below), and Veterinary (see page 321)

Pharmacology and Toxicology (A Graduate Group)

Keith F. Killam, Jr., Ph.D., Chairperson of the Group

Group Office, 4453 Medical Science 1A (Department of Pharmacology), (752-3200)

Faculty

Graduate group faculty members are based in the Departments of Environmental Toxicology, Pharmacology, Veterinary Pharmacology and Toxicology and other related departments and laboratories in Medicine, Veterinary Medicine and Agricultural and Environmental Sciences.

Graduate Study. The Graduate Group in Pharmacology and Toxicology offers programs of study and research leading to the M.S. and Ph.D. degrees. For information on the program of study, contact the appropriate graduate adviser (below) or the group chairperson. See also page 94.

Graduate Advisers. W. W. Kilgore *(Environmental Toxicology)*, R. M. Joy *(Veterinary Pharmacology and Toxicology)*, W. D. Winters *(Pharmacology)*.

Courses in Pharmacology and Toxicology

Graduate Courses

230. Advanced Topics in Pharmacology and Toxicology (1-3) I, II, III. The Staff
Lecture-discussion-seminar—1 hour each (course format can vary at option of instructor). Prerequisite: Pharmacology 200A-200B, Environmental Toxicology 200, or consent of instructor. In-depth coverage of selected topics for graduate students in Pharmacology-Toxicology and related disciplines. Topics determined by instructor in charge for each quarter.

290. Seminar (1) I, II, III. The Staff
Prerequisite: consent of instructor. Current topics in pharmacology and toxicology. (S/U grading only.)

Philosophy

(College of Letters and Science)

Joel I. Friedman, Ph.D., Chairperson of the Department

Department Office, 118 Philosophy Building (752-0607)

Faculty

Ronald A. Arbini, Ph.D., Associate Professor
Fred R. Berger, Ph.D., Professor
William H. Bossart, Ph.D., Professor
[4]Joel I. Friedman, Ph.D., Professor
Neal W. Gilbert, Ph.D., Professor
Marjorie Grene, Ph.D., Professor Emeritus
James Griesemer, Ph.D., Visiting Assistant Professor
John F. Malcolm, Ph.D., Professor
[4]George J. Mattey II, Ph.D., Assistant Professor
Michael V. Wedin, Ph.D., Associate Professor

The Major Program

There are almost as many reasons for studying philosophy as there are students. The most common reason, however, is that philosophy examines the kinds of questions that puzzle all thinking people at some time or another in their lives: Is everything material? Is human behavior determined, or is free choice possible? Can we justify our claims to know anything? Are there objective criteria for distinguishing rational from irrational beliefs? Is there a God? Is morality merely a matter of each individual's feelings, or are there objective principles for deciding what is right or wrong? Thus, the problems studied are of interest to people, regardless of their field.

A second common reason is that being forced to think carefully and precisely about philosophical arguments concerning fundamental issues can be excellent training for the intellectual rigors of any academic subject. Students rightly look on course work in philosophy as helping in the development of intellectual discipline.

A third reason is that the sorts of issues philosophers raise have relevance for most fields. Virtually every University subject, from History to Computer Science, poses philosophical problems when fundamental concepts or methods are discussed. The study of philosophy, then, has relevance through the range of University disciplines.

The Department of Philosophy offers courses in such areas as the theory of knowledge, metaphysics, logic, ethics, and aesthetics. In addition, upper division course work is given in the fields of philosophy of history, philosophy of mathematics, political philosophy, philosophy of religion, and philosophy of the natural and social sciences.

Philosophy is also a subject in which the problems discussed recur, or have important roots in past discussion. The history of philosophy is thus important not only as part of the heritage of educated persons, but also because it is relevant to contemporary issues. The department therefore places great emphasis on the history of philosophy, and provides courses in the major figures and traditions of western philosophy, as well as in the influential contemporary schools of the continental and analytic varieties.

Many students become sufficiently interested to major in philosophy, either with a plan to do graduate work and teach philosophy, or as background training for other professions. Philosophy majors have done extremely well in law schools and medical schools, for example. Also, many philosophy majors go on to advanced work in other academic areas in the humanities and social sciences; graduates have even been known to go into such fields as architecture and art history.

NOTE: For key to footnote symbols, see page 123.

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**16**
Philosophy 12, 21, 22, 23	16
Depth Subject Matter	**36**
Upper division units in Philosophy selected with the approval of the departmental major adviser	36
Total Units for the Major	**52**

Major Advisers. R. A. Arbini, J. F. Malcolm.

Minor Program Requirements:

In consultation with the minor adviser, students may plan a minor in Philosophy. Students may select a broad range of courses, or they may concentrate their work in a special field. Examples of specialized areas of study include philosophy and the sciences, philosophy and society, history of philosophy, and logic and language.

	UNITS
Philosophy	**20**
Ordinarily, 20 upper division units in philosophy, chosen in consultation with minor adviser. In some cases, lower division units may be substituted for no more than 4 upper division units.	

Minor Adviser. N. W. Gilbert.

Courses for Non-Majors. The department offers a range of courses for non-majors. Students pursuing careers in agriculture and engineering might find Philosophy 5 and 10A-G especially useful, since these courses provide practice in concise and logical writing. Science and mathematics students may find these courses useful, as well as Philosophy 12, 107, 108 and 112. Pre-law students and students planning careers in medicine or the various health sciences may be interested in Philosophy 14 and 114A-114B. The offerings at the upper division level include courses of direct relevance to students in psychology, history, art, sociology, anthropology, and political science.

Department Activities The Philosophy Department sponsors a lecture-seminar series of well-known philosophers who present papers in their fields of expertise; and it sponsors the interdisciplinary History and Philosophy of Science lecture series. The department also operates on-going faculty and graduate student colloquia. Undergraduate students are welcome to attend and join these discussions. Information can be obtained in the department office.

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. G. J. Mattey.

Courses in Philosophy

Lower Division Courses

1. Introduction to Philosophy (4) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Problems of philosophy through major writings from various periods. Problems are drawn from political, aesthetic, religious, metaphysical, and epistemological concerns of philosophy.

5. Critical Reasoning (4) III. Berger
Lecture—3 hours; discussion—1 hour; papers or written reports. Criteria of good reasoning in everyday life and in science. Basic principles of deduction and induction; fallacies in reasoning; techniques and aids to reasoning; principles of scientific investigation; aids to clarity.

10A-G. Themes in Philosophy (4) I, II, III. The Staff
Lecture-discussion—3 hours; papers or witten reports. Introductory study of related problems in an area of philosophical interest. Sections to be offered: **(A)** Knowledge and Existence; **(B)** Self and Mind; **(C)** Philosophy and the

Arts; **(D)** Morals and Politics; **(E)** Philosophy East and West; **(F)** Philosophy and Myth; **(G)** Science and Human Nature.

12. Introduction to Logic (4) I, Arbini
Lecture—3 hours; discussion—1 hour. Basic concepts and techniques of deductive logic with emphasis on propositional logic. Development of a deductive system for propositional logic. Translation of English into symbolic formulas.

14. Ethical and Social Problems in Contemporary Society (4) I, 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.

21. History of Philosophy: Ancient (4) I, Malcolm
Lecture—3 hours; discussion—1 hour. A survey of Greek philosophy with special attention to the Pre-Socratics, Plato and Aristotle.

22. History of Philosophy: Seventeenth Century (4) II. Mattey
Lecture—3 hours; discussion—1 hour. Selections from Descartes, Spinoza, Leibniz and Hobbes.

23. History of Philosophy: Eighteenth Century (4) III. Bossart
Lecture—3 hours; discussion—1 hour. Selections from Locke, Berkeley, Hume, and Kant.

Upper Division Courses

(Certain upper division courses may not be offered every year.)

***100. Founders of Modern Thought** (4) II. Gilbert
Lecture-discussion—3 hours; term paper.Prerequisite: not open to philosophy majors or students who have received credit for course 22 or 23. A survey of modern philosophy from Descartes to Kant. Major emphasis upon problems still current today.

101. Metaphysics (4) I, Friedman
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Theories of being. Such topics as reality, substance, universals, space, time, causality, becoming, body, experience, persons, freedom and determinism. Views of the nature and method of metaphysics. Anti-meta physical arguments.

102. Theory of Knowledge (4) I, Mattey
Lecture-discussion—4 hours. Prerequisite: one course in philosophy recommended. Philosophical problems of perception and thought, memory and precognition, imagination, truth and error, belief and knowledge. Types of epistemology.

103. Philosophy of Mind (4) III. 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.

105. Philosophy of Religion (4) III. Gilbert
Lecture-discussion—3 hours: term paper. Prerequisite: one course in philosophy recommended. Logical, metaphysical, epistemological and existential aspects of selected religious concepts and problems.

107. Philosophy of the Physical Sciences (4) I. Griesemer
Lecture-discussion—3 hours; term paper. Prerequisite: one philosophy course or a science background recommended. The nature of testability and confirmation of scientific hypotheses; the nature of scientific laws, theories, explanations, and models. Problems of causality, determinism, induction, and probability; the structure of scientific revolutions.

108. Philosophy of the Biological Sciences (4) III. Ayala (Genetics), Griesemer
Lecture-discussion—4 hours. Prerequisite: a background in a biological science or one philosophy course recommended. Scientific method in biology. Nature of biological theories, explanations, and models. Problems of evolutionary theory, ecology, and sociobiology. Bio-engineering and environmental ethics. (Same course as Genetics 108 and Environmental Studies 108).

109. Philosophy of the Social Sciences (4) II. Berger
Lecture-discussion—4 hours. Prerequisite: one philosophy course or social science background recommended. 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 judgments, and social rules.

112. Intermediate Logic (4) II. Friedman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 12 or consent of instructor. Development of the full quantifier logic, with identity and descriptions; decision procedures; advanced translation of English into the formal language; elementary theory of classes and relations; Russell's paradox.

114A. Introduction to Ethics (4) I, Arbini
Lecture-discussion—3 hours: term paper. Prerequisite: one course in philosophy recommended. An introduction to major writings of philosophers on central problems of right conduct; principles of obligation, responsibility, justice, the meaning of the basic terms of ethical language. Readings from such philosophers as Aristotle, Butler, Hume, Kant, Mill.

114B. Problems of Ethical Theory and Practice (4) II. Berger
Lecture-discussion—3 hours; term paper. Prerequisite: one course in Philosophy recommended. Discussion of important problems of ethical theory with application to contemporary moral problems. Examples: relativism, utility and justice, act and rule utilitarianism, concept of a right, justification of punishment, the death penalty, morality of civil disobedience, abortion, war.

116. Philosophy of Law (4)I, Berger
Lecture—3 hours; term paper. Philosophical theories of the nature of law, legal obligation, the relation of law and morals. Problems for law involving liberty and justice: freedom of expression, privacy, rights, discrimination and fairness, responsibility, and punishment.

***117. Political Philosophy** (4) II. Berger
Lecture-discussion—3 hours; term paper. Prerequisite: one course in Philosophy recommended. Intensive examination of some central concepts of political thought such as the state, sovereignty, rights, obligation, freedom, law, authority, and responsibility.

***118. Philosophy of History** (4) III. Gilbert
Lecture-discussion—3 hours; term paper. Survey of philosophical theories of history and an analysis of contemporary problems of historical explanation.

***123. Aesthetics** (4) II. Bossart
Lecture-discussion—3 hours. Prerequisite: one course in philosophy recommended. Nature of art, of artistic creation, of the work of art, and of aesthetic experience; nature and validity of criticism; relations of art to its environment.

***131. Philosophy of Logic and Mathematics** (4) I, Friedman
Lecture-discussion—3 hours; term paper. Prerequisite: course 12 or one course for credit in mathematics. The nature of formal systems and mathematical theories. Selected topics include philosophy of numbers, logical and semantical paradoxes; foundations of mathematics; set theory, type theory, and intuitionistic theory; philosophy of geometry; philosophical implications of Godel's incompleteness results.

***132. History of Logic** (4) II. Malcolm
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy or logic recommended. Overview of the chief developments in the history of logic.

***133. Survey of Advanced Logic** (4) I. Friedman
Lecture-discussion—3 hours; written reports. Prerequisite: course 112 or consent of instructor. Survey of topics in mathematical logic includes: axiomatic quatifier logic, metalogic, theory of descriptions (Russell and Frege), classes and relations, Russell's Paradox, type theory and axiomatic set theory, models and interpretations, computability theory and decidabilty, Godel's incompleteness theorems, Tarski's theory of truth, and nonstandard logics.

134. Modal Logic (4) III. Mattey
Lecture-discussion—4 hours. Prerequisite: course 112 or the equivalent. Survey of the main systems of modal logic, including Lewis systems S4 and S5. "Possible worlds" semantics and axiomatic treatments. Applications to epistemology, ethics, or temporality.

137. Philosophy of Language (4) I, Wedin
Lecture-discussion—3 hours: term paper. Prerequisite: one course in Philosophy or linguistics. Discussion of problems arising from consideration of the syntax and semantics of natural and formalized languages. Nature of linguistic rules and universals; theories of universal grammar; linguistic implications for theories of cognition.

***143. Hellenistic Philosophy** (4) III. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: course 21.

145. Medieval Philosophy (4) III. Malcolm
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.

151. Philosophy of the Nineteenth Century (4) I, Mattey
Lecture-discussion—4 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.

***155. American Philosophy** (4) III. Gilbert
Lecture-discussion—3 hours: term paper. Prerequisite: one course in Philosophy recommended. Study of such American thinkers as Peirce, James, Royce, Dewey, Santayana, Whitehead, and C.I. Lewis.

***156. Contemporary British Philosophy** (4) II. Arbini
Lecture-discussion—4 hours. Prerequisite: one course in philosophy; course 23 especially recommended. Interpretation and analysis of the most influential works of Bertrand Russell, G.E. Moore, Wittgenstein, J.L. Austin, and G. Ryle.

158. Phenomenology and Existentialism in Germany (4) II. Bossart
Lecture—3 hours; term paper. Prerequisite: course 23 recommended. Twentieth-century German thinkers such as Husserl, Heidegger, Jaspers.

159. Phenomenology and Existentialism in France (4) III. Bossart
Lecture—3 hours; term paper. Prerequisite: course 23 recommended. Twentieth-century French thinkers such as Sartre, Marcel, Merleau-Ponty.

161. Plato (4) I, Malcolm
Lecture-discussion—3 hours. Prerequisite: course 21.

162. Aristotle (4) II. Wedin
Lecture-discussion—4 hours. Prerequisite: course 21 or consent of instructor.

168. Descartes (4) II. Arbini
Lecture-discussion—4 hours. Prerequisite: course 22.

***169. Spinoza** (4) III. Friedman
Lecture-discussion—4 hours. Prerequisite: course 22.

170. Leibniz (4) III. Gilbert
Lecture-discussion—3 hours; term paper. Prerequisite: course 22.

171. Hobbes (4) III. Arbini
Lecture-discussion—3 hours; term paper. Prerequisite: course 22 recommended.

172. Locke (4) II. Malcolm
Lecture-discussion—3 hours.

***173. Berkeley** (4) III. Mattey
Lecture-discussion—3 hours; term paper. Prerequisite: course 23.

***174. Hume** (4) III. Arbini
Lecture-discussion—4 hours. Prerequisite: course 23 recommended.

175. Kant (4) I, Bossart
Lecture-discussion—4 hours. Prerequisite: course 23.

***176. Hegel** (4) II. Bossart
Lecture-discussion—4 hours. Prerequisite: courses 23 and 175 recommended.

190. Special Topics in the History of Philosophy (4) II. Griesemer
Lecture-discussion—3 hours; term paper. Intensive study of special topic, problem, or authors in the history of philosophy. May be repeated for credit.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201. Metaphysics (4) III. Arbini
Seminar—3 hours

202. Theory of Knowledge (4) II. Mattey
Seminar—3 hours.

***206. Philosophical Argumentation** (4) III. Arbini
Seminar—3 hours. Prerequisite: graduate standing. Investigation and evaluation of philosophical arguments. Critical discussion of student papers on various aspects of philosophical disputes.

207. Philosophy of Science (4) II. Griesemer
Seminar—3 hours.

***214. Ethics** (4) III. Berger
Seminar—3 hours.

***261. Plato** (4) III. Malcolm
Seminar—3 hours.

262. Aristotle (4) III. Malcolm
Seminar—3 hours.

***275. Kant** (4) II. Mattey
Seminar—3 hours.

290. History of Philosophy (4) I, Gilbert
Seminar—3 hours. Special topics in the history of philosophy.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

Physical Education

(College of Letters and Science)

William C. Adams, Ph.D., Chairperson of the Department

Herbert A. Schmalenberger, M.A., Vice-Chairperson of the Department

Department Office, 264 Hickey Gymnasium (752-0511)

Faculty

William C. Adams, Ph.D., Professor
Richard L. Bell, Ph.D., Professor *(Chemical Engineering)*
Edmund M. Bernauer, Ph.D., Professor
Robert Biggs, B.A., Adjunct Lecturer
Robert R. Brooks, M.A., Supervisor
Robert E. Bullis, M.A., Adjunct Lecturer
Joseph E. Carlson, M.A., Supervisor
Gary J. Colberg, M.A., Adjunct Lecturer
Jere H. Curry, M.A., Supervisor
Kathleen M. DeYoung, B.A., Assistant Supervisor
Rodney K. Dishman, Ph.D., Adjunct Lecturer
[3,4]Robert L. Foster, M.A., Supervisor
Peter B. Gibson, A.B., Adjunct Lecturer
Pamela L. Gill, M.A., Supervisor
Raymond S. Goldbar, M.A., Supervisor
Robert I. Hamilton, M.S., Supervisor
Jerry W. Hinsdale, A.B., Supervisor
Robert G. Holly, Ph.D., Assistant Professor
Barbara A. Jahn, M.S., Associate Supervisor
Charles R. Kovacic, Ed.D., Professor Emeritus
Willard S. Lotter, Ed.D., Professor
[4]Paul A. Molé, Ph.D., Associate Professor
Donald G. Morris, B.S., Adjunct Lecturer
Becky Nyby, B.S., Adjunct Lecturer
John W. Pappa, M.A., Supervisor
Melvin R. Ramey, Ph.D., Professor *(Civil Engineering)*
[3,4]E. Dean Ryan, E.D., Professor
[3,4]Herbert A. Schmalenberger, M.A., Supervisor
Joe L. Singleton, M.A., Supervisor
James L. Sochor, Ed.D., Supervisor
Phillip S. Swimley, M.A., Supervisor
Jon E. Vochatzer, M.S., Associate Supervisor
Marya Welch, Ed.D., Supervisor
Keith R. Williams, Ph.D., Assistant Professor
Suzanne C. Williams, M.S., Associate Supervisor

The Major Program

The major in Physical Education is designed to effect a broad scholarly understanding of human movement. This is achieved primarily by completion of a core of lower division courses in the biological, physical and behavioral sciences, and a required departmental upper division core of courses. The latter are designed to develop a scientific, integrative understanding of man's acute and chronic responses to physical activity under a broad spectrum of developmental and stressor states. The major permits specialization in either the biological or psychological aspects of physical activity. Career options for students completing the major include allied health, exercise and sports sciences, as well as teaching and coaching.

Physical Education

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**24**
Biological Sciences 1	5
Chemistry 1A	5
Physical Education 45	3
Physics 1A	3
Psychology 1 or 15	4
Statistics 13	4
Depth Subject Matter	**47**
Human Anatomy 101	4
Human Anatomy 101L	2
Physical Education 101, 102, 103, 104, 105	16
Physiology 110	5
Minimum of 12 upper division units in physical education chosen with approval by a major adviser	12

a. *Biological* emphasis
Students electing this emphasis must select a minimum of 9 units from Physical Education 110, 111, 112, 113, or 115.

b. *Psychological* emphasis
Students electing this emphasis must select a minimum of 7 units from Physical Education 120, 121, or 125.

Minimum of 8 upper division non-physical education units in either the biological or the psychological area selected with approval by a major adviser	8

Students are expected to elect the above biological or psychological concentration by the end of the sophomore year. Under special circumstances an individualized curriculum may be elected, but only after consultation with and approval by a major adviser. No variable-unit coursework may be used to fulfill this requirement.

Total Units for the Major **71**

Recommended
Students interested in the biological emphasis of physical education are strongly urged to take Chemistry 8A, 8B.

Major Advisers. W. C. Adams, E. M. Bernauer, R. K. Dishman, R. G. Holly, W. S. Lotter, P. A. Molé, E. D. Ryan, H. A. Schmalenberger, K. R. Williams.

Teaching Major. The teacher-training curriculum in physical education requires courses in addition to the departmental major requirements.

Minor Program Requirements:

	UNITS
Physical Education	**18**
At least 18 upper division units in physical education from one of two options	18

a. *Exercise Physiology*
1) Minimum of two courses from Physical Education 101, 102, 103, 104, 105
2) Minimum of three courses from Physical Education 110, 111, 112, 113
3) Additional courses to complete a total of 18 upper division units

b. *Psychological Aspects*
1) Minimum of two courses from Physical Education 101, 102, 103, 104, 105
2) Minimum of two courses from Physical Education 120, 121, 125
3) Additional courses to complete a total of 18 upper division units

Minor Advisers. Same as major advisers.

Teaching Credential Subject Representative. H. A. Schmalenberger. See page 98 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. W. C. Adams

Class and Recreational Use of Facilities. The incidental fee payable by all students at the time of registration, entitles students to the use of gymnasium, showers, towels, lockers, tennis courts, and the athletic fields. Certain equipment for games and sports is available for exercise and recreation, either with or without instruction. Lockers will be turned in on the last day of class, before the final examination period.

Fines are imposed for each formal transaction necessitated by failure of the student to comply with the regulations of the department.

Courses in Physical Education

Lower Division Courses

1. Physical Education for Men and Women (½) I, II, III. The Staff (Chairperson in charge)
Laboratory—2 hours. Section in: a) sports skills, rules and strategy; b) physical fitness and personal health; c) recreation; d) dance, and e) intercollegiate athletics. May be repeated for a total of 6 units. (P/NP grading only.)

2. Principles of Basic Exercise Conditioning (2) I, II, III. (Swimley in charge)
Lecture—1 hour; laboratory—2 hours. A survey of the basic concepts, facts, and accepted approaches current in selected exercise training regimens, e.g., theory of aerobic function and capacity, exercise and diet in weight control, muscular strength development and maintenance, and limitations of environment, age and gender on fitness levels. (P/NP grading only.)

5. Foundations of Emergency First Aid Services (2) I, II, III. The Staff (Pappa in charge)
Lecture—1 hour; laboratory—1 hour. An introduction to the basic principles and practices that fulfill the prerequisites for advanced study in First Aid and Emergency Medical Services. Upon successful completion of course the Standard Red Cross Certificate is awarded.

7. Professional Physical Education Activities: Men and Women (1) I, II, III. The Staff (Chairperson in charge)
Lecture—1 hour; or laboratory—2 hours. Fundamental skills for: a) coaching competitive athletics; b) classroom teaching and coaching, and c) classroom teaching and officiating. May be repeated for a total of six units.

15. Administration of Intramural Sports (2) II. Colberg
Lecture—2 hours. Planning and administering intramural sports programs at the high school and college level.

25. Theory of Lifesaving and Water Safety (2) I, II, III. Jahn
Lecture—1 hour; laboratory—2 hours. Prerequisite: course 5; 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 Advanced Lifesaving Certificate awarded upon successful completion of necessary requirements.)

27. Training Course for Water Safety Instructors (2) III. Hinsdale
Lecture—1 hour; laboratory—2 hours. Prerequisite: advanced swimming (course 1) or consent of instructor; course 5 and current Advanced Life-Saving Certificate. Theoretical knowledge and practical experience necessary for the organization and teaching of swimming and lifesaving classes. (American Red Cross Water Safety Instructor's Certificate awarded upon successful completion of necessary requirements.)

29. Basic Scuba (2) I, III. Morris
Lecture—2 hours; laboratory—2 hours. Prerequisite: good physical condition; ability to pass preliminary swim test. Introduction to basic knowledge required for SCUBA diving, function and maintenance of equipment, physics and physiology of diving, diver first aid and CPR, oceanography and marine life, and underwater communication. Pool and open water sessions available for certification. (P/NP grading only.)

***30. Synchronized Swimming Composition** (2) I, Jahn
Lecture—1 hour; laboratory—2 hours. Prerequisite: course 1 (synchronized swimming) or consent of instructor. Principles of choreography for solo, duet, and team compositions: style, execution, synchronization. Understanding and appreciation of technical principles of water show productions: basic tools and equipment, principles of set construction, scene painting, costume construction, lighting, and sound equipment.

35A. Dance Composition (2) I.
Laboratory—5 hours. Prerequisite: course 1, modern jazz or jazz dance techniques, or consent of instructor. Composing phrases of movement with a knowledge of elements involved in the craft of choreography: design, dynamics, rhythm, motivation and gesture, vocabulary.

35B. Dance Composition (2) II.
Laboratory—5 hours. Prerequisite: course 35A or consent of instructor. To learn the elements of dance production as it applies to the use of lighting, costume design, selection of music, and building of stage props.

35C. Dance Composition (2) III.
Laboratory—5 hours. Prerequisite: courses 35A, 35B, or consent of instructor. To encourage the student to create new dance forms and prepare them for a 4-7 minute presentation in a spring concert on stage. Costumes and lighting will be created and correlated for each dance by the choreographer.

NOTE: For key to footnote symbols, see page 123.

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 and empirical knowledge to personal, family, and community health problems. (P/NP grading only.)

45. Foundations of Physical Education (3) I, Adams
Lecture—3 hours. An introduction to historical, biomechanical, physiological, psychological and sociological foundations of physical education.

92. Physical Education Internship (2-5) I, II, III. The Staff (Chairperson in charge)
Laboratory—6-15 hours; written project proposal and evaluation. Prerequisite: consent of instructor; enrollment dependent on availability of intern positions, with priority given to Physical Education majors. Work-learn experience in the application of physical activity programs to teaching, recreational, clinical or research situations under department faculty supervision. May be repeated for credit once but no internship units will be counted toward Physical Education major. (P/NP grading only.)

97T. Tutoring in Physical Education (1-5) I, II, III. The Staff (Chairperson in charge)
Tutorial—1-5 hours. Prerequisite: lower division standing and consent of Department Chairperson. Tutoring of students in lower division physical activity courses. Weekly meetings with instructor in charge of courses. Written reports on methods and materials required. May be repeated once for credit. (P/NP grading only.)

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Field Experience in Teaching Physical Education (2) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; field work—4 hours. Prerequisite: upper division standing and appropriate course 1 or 7; consent of instructor. Tutoring or teachers aide in physical education type activities, including athletic coaching, in public schools under the guidance of a regular teacher with supervision by a departmental faculty person. (P/NP grading only.)

101. Physiological Regulation During Exercise (4) I, Bernauer, Molé
Lecture—3 hours; discussion—1 hour alternate weeks with laboratory 3 hours. Prerequisite: Biological Sciences 1; Physiology 110. A study of muscle/neuromuscle, cardiovascular, body fluids, blood, acid base and respiratory metabolic regulations during acute bouts of exercise and work. Focus on physiological and environmental factors limiting capacity and causing fatigue. Role of physical activity in maintaining optimal regulatory functions.

102. Physiological Adaptations to Exercise (2) II. Adams, Bernauer
Lecture—2 hours. Prerequisite: course 101 or consent of instructor. Study of physiological capacities with reference to genotypic and adaptive aspects. Analysis of physiological adaptations to chronic physical activity and selected environmental stressors.

103. Analysis of Human Movement (4) III. K. Williams
Lecture—3 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: Human Anatomy 101 and Physics 1A; Physics 2A recommended. Anatomical and mechanical fundamentals of human motion. Qualitative and quantitative application of kinesiological principles to a variety of movement situations.

104. Introduction to Motor Control and Skill Acquisition (3) I, K. Williams, Dishman
Lecture—2 hours; discussion—1 hour alternate weeks with laboratory—2 hours. Prerequisite: Psychology 1, 15, or 16. Analysis of variables affecting man's ability to produce, learn, and retain movement skills. Basic neurophysiological and behavioral accounts of motor control processes are examined. Theories of movement retention and motor learning are covered.

105. Psychosocial Factors in Motor Performance (3) I (1984-85 only). Ryan
Lecture—3 hours. Prerequisite: Psychology 1, 15, or 16. Survey of theories and experimental findings from social psychology and human motivation and their application to motor performance, including sex differences, success and failure, expectations, anxiety, competition, and aggression. (Course generally taught Fall and Spring Quarters each year.)

110. Exercise Metabolism (3) II. Molé
Lecture—2 hours; laboratory—five 4-hour sessions. Prerequisite: course 101, 102; Chemistry 1A. Focus on energy metabolic pathways and fuels used during different modes of exercise. Also, exercise-induced adaptations which affect metabolism and performance will be discussed. Experiments in laboratory will utilize a variety of techniques to characterize the metabolic responses to exercise.

111. Environmental Effects on Physical Performance (3) III. Adams, Bernauer
Lecture—2 hours; laboratory—3 hours, with discussion—1 hour (alternate weeks). Prerequisite: courses 101 and 102, or consent of instructor. The effects of thermal, barometric and gravitational conditions on physiological function and physical performance of humans. Acute and chronic effects, emphasizing physiological limitations and adaptations, will be studied.

112. Clinical Exercise Physiology (4) III. Holly
Lecture—3 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: courses 101 and 102, or consent of instructor. Physical activity as a therapeutic modality is examined in normal and diseased populations (cardiovascular, pulmonary, diabetic). Assessment (graded exercise testing), exercise prescription and effects of exercise conditioning are examined in detail.

113. Growth and Development in Human Performance (3) II. Molé, Adams
Lecture—3 hours. Prerequisite: Biological Sciences 1, Human Anatomy 101, and Physiology 110. Development of human performance potential from conception to old age, including influence of exercise, athletic participation and preventive medicine. Alterations in motor skill patterns, morphology and body composition, and physiological capacities with aging.

115. Biomechanical Bases of Movement (3) II. K. Williams
Lecture—2 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: course 103 or consent of instructor. Biomechanical bases of human movement investigated; topics include musculo-skeletal mechanics, tissue mechanics, electromyography, and measurement and analysis techniques. Application made to sport, clinical, and work environments, including extensive analysis of locomotion.

120. Sports in American Society (4) III.
Lecture—3 hours; discussion—1 hour. Historical development of sport in American society. Relationship and interaction of sport and politics, economics, religion, art, sexism, racism, and education; current trends and problems.

121. Sports Psychology (4) II.
Lecture—3 hours; discussion—1 hour. Prerequisite: course 105 and Psychology 145. Consideration of major theories, research findings and methods of data collection in sport psychology through a critical examination of relevant experimental, clinical, and field data.

125. Neuromuscular and Behavioral Aspects of Motor Control (3) II. K. Williams, Dishman
Lecture—2 hours; discussion—1 hour to alternate weekly with laboratory—2 hours. Prerequisite: course 104. Factors which affect control of movement from neuropsychological, physiological, behavioral, and mechanical viewpoints. Topics include central vs. peripheral control mechanisms, open and closed loop theories, motor programming, cognitive learning strategies, and the effects of biochemical and biomechanical influences.

128A. Research Diving: 65 Feet (1) II. Bell, Morris
Lecture—1 hour; laboratory—½ hour. Prerequisite: basic SCUBA Certification from approved agency (course 29 or the equivalent); 10 logged open-water dives since certification; and consent of instructor. Lectures in diver rescue, and resuscitation, navigation, search and light salvage, night diving, research methods, work performance under water, cold-water diving, blue-water diving, introduction to deep diving. Pool and open water sessions available for certification (contact Department Office for details). (P/NP grading only.)

128B. Research Diving: 65 Feet (2) III. Bell, Morris
Lecture—1 hour; laboratory—2 hours. Prerequisite: course 128A; consent of instructor. Lectures in diver rescue and resuscitation, navigation, search and light salvage, night diving, research methods, work performance under water, coldwater diving, blue-water diving, introduction to deep diving. Pool and open water sessions available for certification (contact Department Office for details). (P/NP grading only.)

131. Physical Education for the Handicapped (4) II. Holly, Vochatzer
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 103 and consent of instructor. The role of exercise, physical retraining and remedial work in the improvement of movement for handicapped individuals.

132. First Aid Leadership and Accident Management (3) I, II, III. Pappa
Lecture—2 hours; students assist in teaching course 5—1 hour to be arranged. Prerequisite: course 5 or American Red Cross Advanced First Aid Card. Administration, organization and supervision of safety and first aid programs in school and community sports, recreation and all types of group activities. The study and practice of first aid leadership skills. The American Red Cross First Aid Instructor Card will be awarded upon successful completion of the course.

133. Conditioning of Athletes: The Prevention and Care of Sports Injuries (2) II, III. Pappa
Lecture—1 hour; laboratory—2½ hours. Prerequisite: course 5 or the equivalent. An understanding of the use of various types of exercises prior to competition; understanding prime injury areas of participants in all activities and how to handle them.

140. Principles and Theory of Physical Education (4) II. Singleton
Lecture—4 hours. Prerequisite: course 45 or consent of instructor. Critical analysis of the assumptions underlying the physical education program.

142. Physical Education in the Public Schools (3) II. Brooks
Lecture—3 hours. Analysis and study of the principles and methods basic to teaching physical education at the elementary and secondary levels.

144. Principles of Health Education (2) II, III, Lotter
Lecture—2 hours. Prerequisite: course 44 and upper division standing or consent of instructor. Principles of teaching health education in the public schools. (P/NP grading only.)

150. Recreation in the Community (3) III. Jahn
Lecture—2 hours; discussion—1 hour; two Saturday field trips—8 hours. The nature and scope of community recreation programs in California emphasizing low income, highly populated areas and poor rural communities.

192. Physical Education Internship (2-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—6-36 hours; written project proposal and evaluation. Prerequisite: upper division standing and consent of instructor; enrollment dependent on availability of intern positions, with priority given to Physical Education majors. Work-learn experience in the application of physical activity programs to teaching, recreational, clinical or research situations under department faculty supervision. May be repeated for credit for total of 12 units (including course 92), but no internship units will be counted toward Physical Education major. (P/NP grading only.)

197T. Tutoring in Physical Education (1-5) I, II, III. The Staff (Chairperson in charge)
Tutorial—1-5 hours. Prerequisite: consent of 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

200A. Introduction to Research: History and Philosophy in Physical Education (2) I. Bernauer, Molé
Discussion—1 hour; seminar—1 hour. Prerequisite: consent of instructor. Fundamental tenets of science and their application to current research in human performance; benchmark studies in the evolution of the field.

200B. Problem Solving and Research Design in Physical Education (2) II. Bernauer, Molé
Discussion—1 hour; seminar—1 hour. Prerequisite: course 200A. Conventional approaches to problem solving, processes in research design and analysis; written and oral presentation of a thesis proposal

201A. Sports Medicine: Medical Aspects of Sports Injuries (3) I. The Staff (Bernauer in charge)
Lecture—2½ hours; discussion—½ hour. Prerequisite: graduate students with upper division course in systemic physiology or anatomy. Multidisciplinary course introducing the student to pathophysiology of sport injuries, physical examination of the injured athlete, and management of sports injuries. Specific injuries, taping, and use of physical modalities will be discussed (Same course as Orthopaedic Surgery 401A, Physical Medicine and Rehabilitation 201A, 401A.)

220. Research Topics in Biomechanics (3) III. K. Williams
Lecture—2 hours; seminar—1 hour. Prerequisite: graduate standing; course 115 recommended. Survey of current research into diverse areas of biomechanics of human movement. Topics include locomotion, sport biomechanics, electromyography, musculo-skeletal and tissue mechanics,

NOTE: For key to footnote symbols, see page 123.

advances in measurement technology, clinical biomechanics.

221. Anthropometry in Physical Activity (3) III. Adams
Lecture—2 hours; laboratory—five 3-hour sessions to alternate weekly with five 1-hour discussion sessions. Prerequisite: courses 101 and 102. Consideration of physical constitution, body proportions, and body composition in man as they affect physical performance, and of body structural and composition changes accompanying prolonged, systematic physical conditioning. Offered in even-numbered years.

***222. Metabolic Functions in Exercise** (4) III.
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 102, Physiology 114. Review of the current research literature on the metabolic responses to exercise in man; a laboratory survey of respiratory response, metabolic and water balances, blood gas adjustments and acid-base balance with particular reference to the effect of environmental conditions.

223. 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 training and adaptation. Offered in odd-numbered years.

224. Exercise Electrocardiography (2) I, Holly
Lecture—2 hours. Prerequisite: course 112 or consent of instructor. Physiological bases and clinical implications of normal and abnormal exercise electrocardiograms (ECG) are treated in detail. Exercise prescription is considered as is the predictive significance of normal and abnormal ECG.

225. Seminar in Cardiac Rehabilitation (2) II. Holly
Seminar—2 hours. Prerequisite: course 112 or graduate standing and consent of instructor. Critical examination of literature dealing with the causes, prevention and treatment of cardiovascular disease with particular emphasis on intervention through cardiac rehabilitation. Both the theoretical bases and practical approaches to cardiac rehabilitation will be examined.

226. Measurement of the Biological Aspects of Human Performance (3) I. The Staff (Holly in charge)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 101; consent of instructor. Introduction to primary measurement strategies used to investigate the biological bases of human performance. Emphasis placed on the critical selection of the most valid test and on obtaining the most accurate and reliable results.

230. Human Performance: Psychological Aspects (3) II.
Seminar—3 hours. Prerequisite: course 105 or consent of instructor. Critical review of current literature on learning with emphasis on social learning theory and its application to clinical problems related to exercise and sport.

232. Psychological Effects of Physical Activity (3) I, Dishman
Seminar—3 hours. Prerequisite: course 105 or consent of instructor. Analysis of research on the role of physical activity in developing, maintaining, or changing personality and affective states. Special attention will be paid to the potential effect of exercise on mental health.

290. Seminar in Physical Education (1) I, II, III. The Staff (Adams in charge)
Seminar—1 hour. Prerequisite: graduate standing; required of all first year students for first two quarters. Presentation and discussion of topics of interest, and the analysis of research in physical education. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing; consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing; consent of instructor and Department Chairperson. (S/U grading only.)

Professional Courses

300. The Elementary Physical Education Program (2) I, Schmalenberger
Lecture—1 hour; laboratory—2 hours; field trips to selected programs. Prerequisite: senior standing or credential student. Introduction to principles, theories, material, and practices of elementary school physical education program.

380. Methods of Teaching Physical Education (3) III. Brooks
Lecture—1 hour; laboratory—6 hours. Prerequisite: course 142 and six units of course 7; or consent of instructor. The methods of teaching group and individual activities for grades K-12; program planning, class management, organization, and evaluation. (P/NP grading only.)

Physical Medicine and Rehabilitation

See Medicine, School of

Physics

(College of Letters and Science)

John A. Jungerman, Ph.D., Chairperson of the Department

Neal Peek, Ph.D., Vice Chairperson of the Department

Department Office, 225 Physics-Geology Building (752-1500)

Faculty

Franklin P. Brady, Ph.D., Professor
Thomas A. Cahill, Ph.D., Professor
Lawrence B. Coleman, Ph.D., Associate Professor
Linton R. Corruccini, Ph.D., Associate Professor
James E. Draper, Ph.D., Professor
Glen W. Erickson, Ph.D., Professor
Ching-Yao Fong, Ph.D., Professor
Milton E. Gardner, Ph.D., Professor Emeritus
[2,3]Claude Garrod, Ph.D., Professor
Kenneth R. Greider, Ph.D., Professor
John F. Gunion, Ph.D., Professor
James P. Hurley, Ph.D., Associate Professor
John A. Jungerman, Ph.D., Professor
[2]Joseph E. Kiskis, Ph.D., Associate Professor
[4]William J. Knox, Ph.D., Professor
Winston T. Ko, Ph.D., 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., Senior Lecturer
David E. Pellett, Ph.D., Professor
[2,3]Wendell H. Potter, Ph.D., Associate Professor
Roderick V. Reid, Jr., Ph.D., Associate professor
William W. True, Ph.D., Professor
Philip M. Yager, Ph.D., Professor

The Program of Study

While many people think of Physics as levers and pulleys or space shots and atomic reactors, there is much more to the realm of physics. From the smallest subatomic particles to atoms, molecules, stars, and galaxies, the study of Physics is the study of what makes the universe tick. For example the working of the airplane, the paint sprayer, and the pitcher's curve ball are all understood in terms of the same physical law. Information learned from high-energy particle accelerators and nuclear reactors teaches us not only what holds the nucleus and the atom together but also why stars shine and how radiation therapy fights cancer.

As the world becomes more and more complex, the sciences appear to become more difficult to understand. Yet appearances can be deceiving, and many of the most complex phenomena and devices are easily understood and used by those with a good understanding of the basic principles of physics. A major in Physics or in Applied Physics at UC Davis provides a student with this basic knowledge, plus experience in using that knowledge, to get the most out of today's technical world.

Careers in Physics and Applied Physics. The science of physics involves the observation of natural phenomena and events. From these observations comes the mathematical formulation of general principles which may be tested further or applied to specific problems. Because physics is so basic to other sciences, its study provides a background with broad flexibility for later activities.

Careers in physics and applied physics include research and development, either in universities, government laboratories, or industry; teaching in high schools, junior colleges, and universities; management and administration in industrial laboratories and in government agencies; and in production and sales in industry.

A major in either Physics or Applied Physics provides an excellent foundation for graduate work in physics. UCD Physics graduates are regularly admitted to the best physics graduate departments in the country. These majors also provide a strong base for graduate-level work in such interdisciplinary areas as chemical physics, biophysics and medical physics, geophysics and environmental physics, astrophysics and astronomy, computer science, materials science and energy.

The Major Programs

The Department of Physics offers three degree programs: The Bachelor of Arts in Physics, and the Bachelor of Science in Physics and in Applied Physics. The A.B. degree provides a broad coverage of classical and modern physics while permitting a broader liberal arts education than is possible with the other two programs. The B.S. degree in either Physics or Applied Physics should be followed by the student who plans to enter physics as a profession. The B.S. in Applied Physics provides the student with a solid introduction to a particular applied physics specialty. For the student who plans to enter the job market on completing a B.S. degree, the applied physics orientation would be an asset. Either B.S. program provides a solid foundation in physics for the student interested in graduate work in either pure or applied physics.

All three are developed in a highly sequential manner, i.e., Physics 8A-8B-8C-8D and Mathematics 21A-21B-21C and 22A-22B-22C are required for most upper division courses and must be taken in the freshman and sophomore years. Some Applied Physics concentrations have additional recommended lower division courses.

In the freshman year, Astronomy 2 and Physics 7 are recommended for the student who wishes to take a class in this department prior to enrolling in Physics 8 in the Spring Quarter. These courses are introductory to the department and are not preparatory to Physics 8. Honors mathematics is highly recommended for both the freshman and sophomore years.

Students who have completed a high school course in differential and integral calculus can finish the Physics 8 sequence during the freshman year and begin upper division physics courses in the sophomore year by taking Physics S8A in the first summer session prior to entering the University in the fall. This gives these students extra time in the junior and senior years to be used, for example, to complete a double major, to undertake interdisciplinary studies, to participate in research, or to take graduate courses in physics.

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.

Applied Physics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**55**
Physics 8A, 8B, 8C, 8D; 60 (recommended)	16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C	21
Engineering 5	3
Chemistry 1A-1B-1C or 4A-4B-4C	15
Any recommended courses for a particular concentration.	
Depth Subject Matter	**52**

NOTE: For key to footnote symbols, see page 123.

Physics 104A, 104B, 105A, 105B, 110A, 110B, 112A, 115A, 116A, 116B, 122 34
At least 18 units from approved courses within one of the following concentrations chosen in consultation with a major adviser 18
Materials science, physical electronics, quantum optics, energy, applied nuclear physics, chemical physics, atmospheric physics, geophysics, physical oceanography. (Lists of approved courses in each concentration with representative programs are available from the Physics Department.)

Total Units for the Major **107**

Physics

A.B. Major Requirements:

UNITS

Preparatory Subject Matter **37**
Physics 8A, 8B, 8C, 8D 16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C 21

Depth Subject Matter **38**
Physics 104A, 104B, 105A, 105B, 110A, 110B, 112A, 115A, 122 26
At least 7 units from Physics 105C, 110C, 112B, 115B, 129A, 129B, 129C, 140A, 140B 7
At least 5 additional upper division units in physics or astronomy. (No more than 4 units in courses numbered 194H, 195, 198, and 199 may be applied in satisfaction of this requirement.) 5

Total Units for the Major **75**

Recommended
Chemistry 1A-1B-1C or 4A-4B-4C. See also recommended elective courses following the B.S. program below.

Physics

B.S. Major Requirements:

UNITS

Preparatory Subject Matter **52**
Physics 8A, 8B, 8C, 8D 16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C 21
Chemistry 1A-1B-1C or 4A-4B-4C 15

Depth Subject Matter **54**
Physics 104A, 104B, 105A, 105B, 110A, 110B, 110C, 112A, 115A, 115B, 122 33
At least 11 units from Physics 105C, 112B, 129A, 129B, 129C, 140A, 140B 11
At least 10 additional upper division units from physics or astronomy. (No more than 6 units in courses numbered 194H, 195, 198, and 199 may be applied in satisfaction of this requirement.) 10

Units for the Major **106**

Recommended Electives
Astronomy: Astronomy 2.

Computer and numerical analysis: Engineering 5, Mathematics 128A or Engineering: Applied Science 115.

Statistics: Statistics 131A.

Advanced mathematics: Mathematics 108, 118A-118B, 119, 120, 121A-121B, 127A-127B-127C, 185A-185B; Physics 10 (history and philosophy of physics). Prior approval needed for credit.

Program Variance. Courses from other departments may be submitted for courses in the depth subject matter requirements by obtaining written permission from the Undergraduate Curriculum Committee chairperson, as approved by the Department.

Major Advisers.

Contact Departmental Undergraduate Majors Office, 219 Physics-Geology Building, for adviser assignment.

Minor Program Requirements:

Three distinct minors are offered, all requiring prerequisites equivalent to Mathematics 21A-21B-21C and 22A-22B-22C and Physics 8A-8B-8C-8D. Students considering the possibility of becoming a Physics major should consult with a Physics major adviser before beginning work in one of these minor programs.

UNITS

Physics **20-24**

Classical Physics emphasis **21-22**
Physics 104A, 105A, 105C, 110A-110B, plus two additional upper division physics courses which must include either 108 or 112A or both 21-22
(If the fall quarter courses, 104A, 105A, 110A, 112A, are taken in different years, 104A and 105A should be taken in the first year; course 105C does not really require 105B first.)

UNITS

Quantum Physics emphasis **20**
Physics 104A-104B, 112A, 115A-115B, plus at least one quarter from 121, 129A-129B-129C, 140A-140B 20
(Physics 104A-104B must precede 115A-115B; and 115A must precede 140A or 129B.)

UNITS

General Physics emphasis **24**
Physics 104A-104B, 105A, 110A-110B, 112A, 115A, plus another upper division physics course 24
(Physics 104A-104B must precede 115A.)

Teaching Credential Subject Representative. R. V. Reid. See page 98 for the Teacher Education Program.

Graduate Study. The Department of Physics offers programs of study and research leading to the M.A. and Ph.D. degrees and the Ph.D. degree with an Applied Physics Research Specialty. Further information regarding requirements for these three degrees, graduate research, teaching assistantships, and research assistantships may be obtained by writing to the Chairperson, Department of Physics, University of California, Davis 95616.

Astronomy. There is no major program leading to a degree in Astronomy. Introductory courses are offered in general astronomy and astrophysics. Students who wish to use the observatory or the portable telescopes may do so through the 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) I. The Staff
Lecture—3 hours; laboratory-discussion—2 hours. Prerequisite: good facility in high school physics and mathematics (algebra and trigonometry). Description and interpretation of astronomical phenomena using the laws of modern physics. Modern astronomical instrumentation. Gravitation, relativity, electromagnetic radiation, atomic and nuclear processes in relation to the structure and evolution of stars, the solar system, galaxies, and the Universe. Not open to students who have received credit for course 10.

10. Introduction to General Astronomy (4) III. The Staff
Lecture—3 hours; laboratory-discussion—2 hours. A nonmathematical 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 course 2 or any physics course (except 10).

Upper Division Course

127. Introduction to Astrophysics (3) II. The Staff
Lecture—3 hours. Prerequisite: Physics 8B, Mathematics 21C and knowledge of astronomy or consent of instructor. Celestial mechanics, radiation, astrophysical measurements, electromagnetic processes, the sun, binary and variable stars, stellar structure and evolution, galaxies, cosmology. (Same course as Physics 127.)

Courses in Physics

Physics 10 is primarily a concept-oriented one-quarter lecture/discussion course requiring relatively little mathematical background.

Physics 7 is a one-quarter descriptive course intended to inform prospective physics majors about the various fields of physics now under intensive study.

Physics 1 is a two-quarter sequence requiring some mathematics (trigonometry). Either 1A alone or both quarters may be taken. The sequence is not intended to satisfy entrance requirements of a year of physics for professional schools, but will satisfy requirements of 3 or 6 units of physics.

Physics 2 is a three-quarter sequence using some calculus (mostly concepts rather than calculations). The entire sequence is recommended, rather than just 1 or 2 quarters. Physics 3 is the laboratory course that accompanies Physics 2.

Physics 8 is a four-quarter sequence using calculus throughout and including laboratory work as an integral part. The course is designed primarily for students in the physical sciences and engineering.
Note: Faculty listed for each course are well acquainted with the course, but may not teach it this year.

Lower Division Courses

1A. Principles of Physics (3) I, McColm
Lecture—3 hours. Prerequisite: trigonometry or consent of instructor. Mechanics. Introduction to general principles and analytical methods used in physics with emphasis on applications in applied agricultural and biological sciences and in physical education. Not open to students who have received credit for course 2A or 8A.

1B. Principles of Physics (3) II. McColm
Lecture—3 hours. Prerequisite: course 1A or 2A and consent of instructor. Continuation of course 1A. Heat, optics, electricity, modern physics. Not open to students who have received credit for course 2B, 2C, or 8B.

2A. General Physics Lecture (3) I, II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: Mathematics 16B (may be taken concurrently). Mechanics. Introduction to general principles and analytical methods used in physics. Not open to students who have received credit for course 1A.

2B. General Physics Lecture (3) II, III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 2A (or 1A with consent of instructor); Mathematics 16B. Electricity and magnetism, heat, kinetic theory, and thermodynamics. Not open to students who have completed course 1B.

2C. General Physics Lecture (3) I, III. The Staff
Lecture—3 hours. Prerequisite: course 2B. Wave motion, optics, modern physics. Not open to students who have received credit for course 1B.

3A. General Physics Laboratory (1) I, II. The Staff
Laboratory—2½ hours. Prerequisite: course 2A (may be taken concurrently) or consent of instructor. Mechanics. Experimental work planned to accompany the lectures in course 2A. Recommended for students electing course 2A.

3B. General Physics Laboratory (1) II, III. The Staff
Laboratory—2½ hours. Prerequisite: course 3A. Electricity and magnetism, heat, kinetic theory, and thermodynamics. Experimental work planned to accompany the lectures in course 2B. Recommended for all students who take course 2B.

3C. General Physics Laboratory (1) I, III. The Staff
Laboratory—2½ hours. Prerequisite: course 3B. Wave motion, optics, modern physics. Experimental work planned to accompany the lectures in course 2C. Recommended for all students who take course 2C.

7. Contemporary Directions in Physics (1) II. The Staff
Lecture—1 hour; one hour field trip to campus laboratory. A series of talks by invited speakers describing the various fields now under intensive study: high energy physics, nuclear, atomic and condensed matter physics. Interdisciplinary fields, such as atmospheric physics, will also be discussed. (P/NP grading only.)

8A. Classical Physics (4) III. The Staff
Lecture—3 hours; discussion—1 hour; laboratory—2 hours. Prerequisite: Mathematics 21B (may be taken concurrently). Mechanics. Introduction to general principles and analytical methods used in physics for physical science and engineering majors. Only two units of credit allowed for students who have received credit for course 1A or 2A.

8B. Classical Physics (4) I. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: course

NOTE: For key to footnote symbols, see page 123.

8A or 2A with consent of instructor; Mathematics 21C, and 22C (may be taken concurrently). Continuation of course 8A. Fluid mechanics, electricity and magnetism including circuits and Maxell's equations. Only two units of credit allowed for students who have received credit for course 1B or 2B.

8C. Classical Physics (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 8B; Mathematics 22B (may be taken concurrently). Continuation of courses 8A and 8B. Thermodynamics, wave phenomena, optics. Students who have had Engineering 105A may not receive credit for Physics 8C; and those who have had course 2B or 2C may receive only two units of credit.

8D. Modern Physics (4) III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1½ hours. Prerequisite: course 8C and Mathematics 22B; Mathematics 22A (may be taken concurrently) recommended. Introduction to Physics since 1900. Special relativity, quantum mechanics, atoms, molecules, condensed matter, nuclei, particle physics. Students who have had course 2C may receive only 2 units of credit for course 8D.

10. Basic Concepts of Physics (4) I, II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra; students having had any other physics course must have departmental approval prior to enrolling. Survey of basic principles: motion, gravitation, electricity and magnetism, light, relativity, atoms, quanta, nuclei, elementary particles. Includes lecture demonstrations and elementary problem solving. Check with the department office for the emphasis (history/philosophy, energy/environment, natural phenomena, etc.) each quarter.

37. Physics of Nuclear Arms Effects and Control (1) II. Jungerman
Lecture—discussion—1 hour. Prerequisite: high school algebra. Students who have had any other physics course must have departmental approval before enrolling. Intended for students in Letters. Enrollment in course 137 (concurrently). Course will emphasize physics concepts of course 137. (Same course as Engineering: Applied Science 37.)

60. Introduction to Applied Physics (1) III. The Staff
Lecture—1 hour. Prerequisite: course 8D (may be taken concurrently). A series of lectures describing current fields of research in applied physics. Topics covered will include materials science, physical electronics, energy, applied nuclear physics, chemical physics, atmospheric physics, physical oceanography, and applied mathematical physics. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chair person in charge)
Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

104A-104B. Introduction to Methods of Mathematical Physics (3-3) I-II. Erickson
Lecture—3 hours. Prerequisite: course 8B. Mathematics 22C. Elements of vector and tensor analysis, matrix methods, boundary value problems, integral transforms with applications to physics.

105A. Analytical Mechanics (3) I. Ko
Lecture—3 hours. Prerequisite: course 8A; Mathematics 22A, 22B, 22C. Principles and applications of Newtonian mechanics.

105B. Analytical Mechanics (3) II. Ko
Lecture—3 hours. Prerequisite: courses 8C and 105A. Continuation of course 105A; introduction to Lagrange's and Hamilton's equations.

105C. Continuum Mechanics (3) III. Yager
Lecture—3 hours. Prerequisite: courses 104B, 105A. Continuum Mechanics.

108. Optics (3) III. Cahill
Lecture—3 hours. Prerequisite: course 8 or 2 sequence and Mathematics 21 sequence or consent of instructor. The phenomena of diffraction, interference, and polarization of light, with applications to current problems in astro-physics, material science, and atmospheric science. Study of modern optical instrumentation. Open to non-majors.

108L. Optics Laboratory (1) I, Cahill
Laboratory—3 hours. Prerequisite: current enrollment in 108. The laboratory will consist of one major project pursued throughout the quarter, based on modern applications of optical techniques.

110A-110B-110C. Electricity and Magnetism (3-3-3) I-II-III. Draper
Lecture—3 hours. Prerequisite: course 8C; Mathematics 22C. Theory of electrostatics, electromagnetism, Maxwell's equations, electromagnetic waves.

112A-112B. Thermodynamics and Statistical Physics (3-3) I-II. Corruccini
Lecture—3 hours. Prerequisite: course 8A-8B-8C-8D; Mathematics 22C; and Physics 105B or 115A or the equivalent. Introduction to statistical mechanics and thermodynamics.

115A-115B. Introduction to Quantum Mechanics (3-4) III-I. Jungerman
Lecture—3 hours (115A); lecture—3 hours plus problem sets (115B). Prerequisite: courses 8D, 104B, 105B. The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.

116A. Electronic Instrumentation (4) II. Cahill
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 8C, Mathematics 22B. An experimental and theoretical study of important electronic circuits commonly used in physics.

116B. Electronic Instrumentation (4) III. Potter
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 8D, 116A. Continuation of course 116A. Introduction to the use of digital electronics and microcomputers in experimental physics.

121. Foundations of Atomic and Molecular Physics (4) III. McColm
Lecture—3 hours; outside work—9 hours. Prerequisite: course 8D; Mathematics 21C. The phenomena of atomic physics; introduction to quantum phenomena and quantum mechanics; selected topics dealing with atoms, molecules, nuclei, and the solid state.

122. Advanced Physics Laboratory (2) I, II. The Staff
Discussion—1 hour; laboratory—3-6 hours. Prerequisite: course 8. Experimental techniques and measurements in atomic, nuclear, and solid-state physics. May be repeated once for credit.

123. Applications of Nuclear Physics (3) I, Peek
Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Applications to environmental, medical, and energy source problems. Course emphasizes but is not limited to experimental programs underway at Crocker Nuclear Laboratory. Student participation in one such experimental program is the required lab work.

127. Introduction to Astrophysics (3) II. The Staff
Lecture—3 hours. Prerequisite: course 8B and Mathematics 21C and knowledge of astronomy or consent of instructor. Celestial mechanics, radiation, astrophysical measurements, electromagnetic processes, the sun, binary and variable stars, stellar structure and evolution, galaxies, cosmology. (Same course as Astronomy 127.)

129A. Introduction to Nuclear and Particle Physics (4) I, Knox
Lecture—3 hours; term paper. Prerequisite: course 8D; Mathematics 22C. Survey of basic nuclear properties and concepts requiring only rudimentary knowledge of quantum mechanics.

129B. Nuclear Physics (4) II Knox
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.

137. Science and Technology of Nuclear Arms Effects and Control (3) II. Jungerman, Craig
Lecture—3 hours. Prerequisite: upper division standing; one course from courses 1B, 2C, 8D, 10 or 37; course 37 (may be taken concurrently). Scientific and technical aspects of nuclear arms effects and nuclear arms control including nuclear physics of atomic and hydrogen bombs, blast and radiation effects radioactivity, electromagnetic pulse, ICBM accuracy, laser weapons, verification safeguards, biological and ecological effects. Emphasis on order of magnitude calculations. (Same course as Engineering: Applied Science 137.)

140A. Introduction to Solid-State Physics (4) II Corruccini
Lecture—3 hours; outside work—9 hours. Prerequisite: course 115A or 8D, and consent of instructor. Survey of basic concepts and classification of experimental phenomena in solids. Crystal structure, phonons, simple metals.

140B. Introduction to Solid-State Physics (4) III. Corruccini
Lecture—3 hours; outside work—9 hours. Prerequisite: course 140A. Discussions of the following: energy bands and Fermi surfaces, transport phenomena, semiconductors, ferromagnetism, magnetic resonance.

153. Introduction to Heat Transfer (2) I, McColm
Lecture—1 hour; outside readings and extensive problem sets. Prerequisite: courses 104A-104B, 105A-105B, 115A; 112A (may be taken concurrently). Fundamentals of conductive, convective and radiative heat transfer with an emphasis on the solution of practical problems involving the combined modes of conduction and convection. Viscous fluid dynamics pertinent to convective heat transfer.

194H. Special Study for Honors Students (4) I, II, III. The Staff (Chairperson in charge)
Prerequisite: open only to seniors who qualify for the honors program. Independent research and/or reading on selected topics.

195. Senior Thesis (5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: physics major or senior standing. Preparation of a senior thesis on a topic selected by the student with approval of the department. May be repeated for a total of 16 units and for no more than 5 units in any one quarter without Departmental approval.

197T. Tutoring in Physics and Astronomy (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor and department chairperson. Tutoring of students in lower division course. Weekly meetings with instructor. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200A. Theory of Mechanics and Electromagnetics (3) I, True
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. True
Lecture—3 hours. Prerequisite: course 200A; Mathematics 220B (concurrently). Hamilton's equations. Hamilton-Jacoby 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. Hurley
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, Hurley
Lecture—3 hours. Prerequisite: course 200C. Diffraction theory. Radiating systems and electron theory.

215A. Quantum Mechanics (3) I, Reid
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. Reid
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 Reid
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
Lecture—3 hours. Prerequisite: courses 112B and 115B. Foundations of classical and quantum statistical mechanics.

219B. Statistical Mechanics (3) II. Garrod
Lecture—3 hours. Prerequisite: course 219A. Applications to properties of solids, real gases, nuclear matter, fluctuations about the equilibrium state.

221. Atomic Physics (3) III. McColm
Lecture—3 hours; seminar—1-2 hours. Prerequisite: course 215A-215B. Term structure of atoms using the angular momentum formalism; methods of computing wave functions and radial integrals; splitting in external fields; term structure in crystals; scattering and collisions. Not offered every year.

223. Group-Theoretical Methods of Physics (3) III. Kiskis
Lecture—3 hours. Prerequisite: courses 215A-215B-215C or consent of instructor. Theory of groups and their representations with applications in selected areas of physics.

224A. Nuclear Physics (3) II. Brady
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) III. Brady
Lecture—3 hours. Prerequisite: course 224A. Study of nu-

NOTE: For key to footnote symbols, see page 123.

clear 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) III. 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, Gunion
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. Gunion
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-240C. Solid-State Physics (3-3-3) II-III-I. Fong
Lecture—3 hours. Prerequisite: courses 215A-215B-215C and 140A. One electron model of solids; transport properties; optical properties; properties of lattice waves; electron-phonon interaction; superconductivity; magnetism; noncrystalline solids.

245A-245B. High Energy Physics (3-3) II-III. Ko
Lecture—3 hours. Prerequisite: course 215A. Systematics of elementary particle interactions; determination of quantum numbers; interpretation of experiments; selected special topics in second quarter. Not offered every year.

250. Special Topics in Physics (3) I. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Topic varies from year to year. May be repeated three times for credit.

251. Special Topics in Applied Physics (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Topic varies from quarter to quarter. May be repeated three times for credit. Not offered every quarter.

252A. Techniques of Experimental Physics (3) III. Potter
Lecture—3 hours. Introduction to techniques and methods of designing and executing experiments. Problems and examples from condensed matter will be utilized.Offered in odd-numbered years.

252B. Techniques of Experimental Physics (3) III. Lander
Lecture—3 hours. Introduction to techniques and methods of designing and executing experiments. Problems and examples from nuclear and particle research will be utilized. Offered in even-numbered years.

290. Seminar (1-3) I, II, III. The Staff (Chairperson in charge)
Seminar—1-3 hours. (S/U grading only.)

291. Seminar in Nuclear Physics (1-2) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

292. Seminar in Theoretical Physics (1-2) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

293. Seminar in Solid-State Physics (1-2) I, II, III. Fong, Potter
Seminar—1-2 hours. (S/U grading only.)

294. Seminar in Applied Physics (1-2) I, II, III. The Staff (Chairperson in charge)
Seminar—1-2 hours. Presentation and discussion of current topics in applied physics by visiting lecturers, staff and students. (S/U grading only.)

295. Introduction to Departmental Research (1) I. The Staff (Chairperson in charge)
Seminar—1 hour. Seminar to introduce first- and second-year physics graduate students to the fields of specialty and research of the Physics staff. (S/U grading only.)

297. Techniques of Teaching Physics (3) III. Greider
Prerequisite: consent of instructor and Department Chairperson. Study of devices and methods used to teach physics at the college level. Participation in presenting lectures and demonstrations in undergraduate classes. Preparation of new material for lectures and laboratories. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-2) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Physiological Sciences

(School of Veterinary Medicine)

Richard A. Freedland, Chairperson of the Department

Department Office, 1094 Haring Hall (752-1373)

Faculty

Arthur L. Black, Ph.D., Professor
Michael L. Bruss, D.V.M., Ph.D., Assistant Professor
Victor W. Burns, Ph.D., Professor
[2]Charles E. Cornelius, Ph.D., Professor *(California Primate Research Center*
Donald L. Curry, Ph.D., Associate Professor
James R. Etchison, Ph.D., Assistant Adjunct Professor *(Internal Medicine)*
Richard A. Freedland, Ph.D., Professor
Jerry R. Gillespie, D.V.M., Ph.D., Professor
Marvin Goldman, Ph.D., Professor *(Laboratory for Energy-Related Health Research)*
Robert J. Hansen, Ph.D., Associate Professor
Wesley R. Harris, Ph.D., Assistant Adjunct Professor *(Laboratory for Energy-Related Health Research)*
Benjamin L. Hart, D.V.M., Ph.D., Professor
Alfred A. Heusner, Docteur-es-Sciences, Professor
James G. Morris, Ph.D., Professor *(Animal Science)*
Stuart A. Peoples, M.D., Professor Emeritus
Joyce L. Remsen, Ph.D., Associate Adjunct Professor (Laboratory for Energy-Related Health Research)
Quinton R. Rogers, Ph.D., Professor
J.P. Schreider, Ph.D., Assistant Adjunct Professor *(Laboratory for Energy-Related Health Research)*

Courses in Physiological Sciences

Upper Division Courses

101A-101B. Physiological Chemistry (4-3) I-II. Freedland
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

205A. Intermediary Metabolism of Animals (4) I. Freedland, Baldwin
Lecture—4 hours. Prerequisite: a course in biochemistry or physiological chemistry or consent of instructor; a course in physiology recommended. Biochemical data as related to metabolism of intact animals. Pathways and control in biosynthesis and degradation of carbohydrates and lipids; including hormonal, nutritional, and genetics effects. Dynamics of animal metabolism including pools and turnover rates. Offered in even-numbered years.

205B. Intermediary Metabolism of Animals (3) II. 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. Offered in odd-numbered years.

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 243A-243B (concurrently). Study of radioisotope properties, uses and measurement methods relevant to the biological sciences.

260. Comparative Bioenergetics (4) II. Heusner
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 107A. Fundamentals of thermodynamics and their application in physiology; entropy, probability, information, and thermodynamic potentials. Theory of biological similarity; dimensional analysis, poikilothermy, heterothermy, homeothermy, and biological time.

280. Advanced Pulmonary Physiology (3) II. Gillespie
Lecture—3 hours. Prerequisite: graduate student status or consent of instructor. Advanced study of physiology of mammalian respiration with emphasis on mechanisms of ventilation, gas distribution, diffusion and blood perfusion. Offered in even-numbered years.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour.

291. Cell Biophysics (1) III. Burns
Lecture—½ hour; seminar—½ hour. Prerequisite: consent of instructor. Discussion of modern approaches to understanding the cell as an organized system. Topics may include fluorescence of cells and constituents, models of energy metabolism and metabolic dynamics, biological pattern formation, historical development of concepts. Offered in even-numbered years. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

397T. Tutoring in Physiological Sciences (1-5) I, II, III. The Staff
Prerequisite: graduate or professional student standing and consent of instructor. Designed for graduate or professional students who desire teaching experience, but are not teaching assistants. (S/U grading only.)

Physiology

See below, and the Graduate Group (page 287); and also Human Physiology (Medicine), Plant Physiology, and Zoology

Physiology

(College of Agricultural and Environmental Sciences)

Faculty

See under Departments of Animal Physiology, Animal Science, and Avian Sciences.

The Major Program

The Physiology major is designed to provide an understanding of the vital functions of living organisms and includes a systematic study of the functional properties of tissues and organs and comparison of processes among different kinds of animals. It will provide the foundations for a challenging career in physiology and also serve as a basis for further training in schools of human and veterinary medicine, medical technology, pharmacy, dentistry, optometry, and other health sciences.

NOTE: For key to footnote symbols, see page 123.

Students interested in research and advanced teaching may use the program as preparation for continued study leading to advanced degrees.

Choice of College.

The Bachelor of Science degree is offered in both the College of Agricultural and Environmental Sciences and College of Letters and Science.

Students majoring in Physiology in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Physiology

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *(Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**43-47**
Chemistry (Chemistry 1A-1B-1C and 5 or 4A-4B-4C; 8A-8B or 128A-128B)	21-25
Mathematics (Mathematics 16A, 16B, 16C, Statistics 13)	13
Physics 2A-2B-2C	9
(The above preparatory courses must be taken on a letter-grade basis.)	
Depth Subject Matter	**33**
Physiology, including, Physiology 100A-100B, 100L, 110, 110L, 111A-111B	33
(These courses may not be taken on the Passed/Not Passed option.)	
Breadth Subject Matter	
College of Agricultural and Environmental Sciences students	**16**
Social sciences and humanities	8
English (see College requirement)	8

Additional requirements as described on page 71.

College of Letters and Science students: Refer to page 88 for a description of requirements to be completed in addition to the major.

Restricted Electives	**30**
Upper division units, chosen with adviser's approval, constituting a sequence in biochemistry, morphology, and selected biological science courses or mathematics, chemistry, physics, and/or engineering. No course 192 or more than 5 units of courses 106A, 106B, 190C, 191, 196A, 196B, and 199 will be accepted as restricted electives. (These courses may not be taken on the Passed/Not Passed option.)	
Unrestricted Electives	**54-58**
Total Units for the Major	**180**

Major Adviser.

J. M. Horowitz, V. E. Mendel.

Graduate Study. The Graduate Group in Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees. Information on graduate study can be obtained from the graduate adviser or the *Graduate Announcement.*

Graduate Advisers. *A-F:* P.A. Molé *(Physical Education); G-N:* B.A. Horwitz *(Animal Physiology); O-Z:* R.E. Smith *(Human Physiology).*

Related Courses. See also Physiology 2, 2L, and 10 listed under the Department of Zoology course listing (page 326).

Courses in Physiology

Upper Division Courses

100A. General Physiology (3) I, Horwitz
Lecture—3 hours. Prerequisite: Biological Sciences 1 and Chemistry 8B; Physics 2C recommended. Examination of the interaction of various intracellular compartments in the functioning of the animal cell. Emphasis is placed on metabolic bases and regulation of cellular function. Cell and tissue structure are discussed in relation to physiological mechanisms.

100B. General Physiology (3) II. Horwitz, Pappone
Lecture—3 hours. Prerequisite: course 100A. Continuation of course 100A with particular emphasis on transport phenomena, cell recognition and communication, and properties of excitable cells.

100L. General Physiology Laboratory (2) II. Horwitz, Horowitz
Discussion—five 2-hour sessions (alternate weeks); laboratory—five 6-hour sessions (to alternate with discussion). Prerequisite: courses 100A, 100B (concurrently), Biological Sciences 1; or consent of instructor. Laboratory in the physical and chemical processes of cells and tissues.

102. Physiology of Growth (3) III. Smith
Lecture—3 hours. Prerequisite: course 110. The nature of the growth of cells, organs, organisms and population, and their regulatory processes. Emphasis is placed on the quantitative evaluation of growth.

106A. Experiments in Physiology: Design and Execution (3) III. The Staff (Barkley in charge)
Discussion—total of 6 hours; laboratory—7-9 hours. Prerequisite: course 100A, 100B, 100L; consent of instructor. Allows students to experimentally examine current physiological problems. Following group discussions on approaches to designing experiments, groups of 2-3 students will choose a project and design an experimental protocol that they will then carry out and report upon. (P/NP grading only.)

106B. Experiments in Physiology: Design and Execution (3) I. The Staff (Barkley in charge)
Discussion—two 2-hour meetings during quarter, laboratory—9 hours. Prerequisite: course 106A and consent of instructor. Continuation of course 106A. (P/NP grading only.)

110. Systemic Physiology (5) I, II, III. Barkley, Colvin, Goldberg, Sillman, Weidner
Lecture—5 hours. Prerequisite: Biological Sciences 1. Physiology of organ systems; including concepts of integrative and homeostatic mechanisms.

110L. Systemic Physiology Laboratory (2) I, III. Barkley, Goldberg
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 110 prior to taking 110L recommended, but 110 may be taken concurrently. Selected experiments to illustrate functional characteristics of organ systems discussed in course 110.

111A-111B. Advanced Systemic Physiology Laboratory (3-3) II-III. Burger, Carstens
Lecture—1 hour, discussion—five 2-hour sessions (to alternate with laboratory); laboratory—five 6-hour sessions. Prerequisite: course 110; courses 112, 113, 114 recommended. Selected experiments in depth on the neural, cardiovascular, respiratory, renal, and endocrine systems. Emphasis on modern conceptual and methodological approaches using several species in demonstrating the physiology of organ systems.

112. Neural and Endocrine Control Systems‡ (4) I, Horowitz, Barkley, Carstens
Lecture—4 hours. Prerequisite: course 110. The nature, functional significance, and integration of neuronal and endocrine control of physiological processes. Emphasis will be placed on neuroendocrine, neural sensory, and motor systems, higher neural integration, and control of metabolic and reproductive status.

113. Cardiovascular, Respiratory, and Renal Physiology‡ (4) II. Goldberg, Weidner
Lecture—4 hours. Prerequisite: course 110; Chemistry 8B, Physics 2A, 2B, 2C recommended. An intense and advanced presentation of concepts in cardiovascular, respiratory, and renal physiology including discussion of acid-base balance. Recommended for Physiology students, graduate students, and others in allied interests.

114. Gastrointestinal Physiology‡ (3) III. Mendel
Lecture—3 hours; term paper.. Prerequisite: course 110; Biochemistry 101B or Physiological Sciences 101B recommended. Advanced gastrointestinal physiology covering absorption, secretion, motility, and special emphasis on endocrinology and innervation. Emphasis will be on physiology of the gastrointestinal tract; some pathology and nutritional items will be covered.

117. Avian Physiology (3) III. Burger
Lecture—3 hours. Prerequisite: course 110 or Zoology 2. Physiology of the various systems of birds with emphasis on digestion, respiration, excretion, and endocrine system.

117L. Avian Physiology Laboratory (2) III. Burger
Discussion—five 2-hour sessions; laboratory—five 6-hour sessions. Prerequisite: course 117 (may be taken concurrently). Laboratory instruction in selected organ sysems of the bird.

120A. Comparative Physiology: Neurointegrative Mechanisms (3) III. Woolley
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: neurointegrative mechanisms of integration including aspects of phylogenetic development at both neuronal and systemic levels.

120B. Comparative Physiology: Circulation (3) III. Goldberg, Rhode
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: circulation. Comparative approach to cardiovascular function in vertebrates and invertebrates. Offered in odd-numbered years.

120C. Comparative Physiology: Digestion (3) III. Colvin
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom; digestion. Offered in even-numbered years.

120D. Comparative Physiology: Endocrinology (3) III.
Lecture—3 hours. Prerequisite: course 110. Comparison of physiological functions in the animal kingdom: animal hormones and their functions.

120E. Comparative Physiology: Respiration (3) II. Smith, Burger
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: respiration. Offered in even-numbered years.

121. Physiology of Reproduction (3) II. Anderson
Lecture—3 hours. Prerequisite: course 110. Physiological mechanisms related to reproduction, breeding efficiency, and fertility, with special reference to domestic animals.

121L. Physiology of Reproduction Laboratory (1) II. Anderson
Laboratory—3 hours. Prerequisite: course 121 (may be taken concurrently) recommended. Experiments on the reproductive systems of domestic animals including male and female gametes. (P/NP grading only.)

130. Physiology of the Endocrine Glands (4) I, Moberg
Lecture—4 hours. Prerequisite: course 110. Advanced presentation of concepts in endocrinology with emphasis on the role of hormones in reproduction, metabolism, and disease.

147. Aviation Physiology (3) II. Smith
Lecture—3 hours. Prerequisite: course 110. The nature and physiological consequences of the aviation environment (altitude, acceleration, motion, etc.) and of protective devices (oxygen equipment, G-suits, etc.). Field trips will be available (as course 198) to visit operational aviation physiology installations. Offered in odd-numbered years.

148. Principles of Environmental Physiology (3) II. Smith, Mendel. ———
Lecture—3 hours. Prerequisite: course 110 and 100A or Biochemistry 101A or the equivalent. Physiological aspects of interactions of organisms and environment at cellular, system, and organismal levels. Emphasis on regulatory responses/mechanisms to thermal, pressure and osmotic environmental variables.

149. Environmental Physiology of Domestic Animals (3) III. Millam
Lecture—3 hours. Prerequisite: courses 110-110L, or Zoology 2. Influences of environmental factors on physiological processes related to animals including man. The nature of environmental variations which influence physiological responses are given emphasis.

190. Proseminar in Physiology (3) I, II, III. The Staff (Horowitz in charge)
Seminar—3 hours. Prerequisite: courses 110 and 100A, one additional upper division course in physiology or a related course in science, and consent of instructor. Student presentations, discussion, and critical evaluation of material in important areas of physiology. Topics may vary from year to year. Limited enrollment.

190C. Introduction to Physiological Research (1) I, II, III. The Staff (Horowitz in charge)
Discussion—1 hour. Prerequisite: upper division standing in physiology or related biological science; consent of instructor. Introduction to research findings and methods in physiology. Presentation and discussion of research by

‡This course is in a group from which one or more may be chosen; however, to be considered as having had full exposure to advanced systemic physiology a student must take courses 112, 113, 114, 120A, 121, 121L, and 130. A student with special interests in comparative physiology may wish to select courses form the 120 series.

NOTE: For key to footnote symbols, see page 123.

faculty and students. May be repeated for credit. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in physiology. (P/NP grading only.)

196A. Voluntary Control of Physiological Processes (2) I, II, III. Lorenz
Seminar—1 hour; laboratory—3 hours. Prerequisite: adequate upper division preparation in at least one of the following: physiology, behavioral science, computer science, physics or electrical engineering and consent of instructor. Individual or team projects in voluntary control of physiological processes emphasizing application of microcomputer-assisted biofeedback techniques. (P/NP grading only.)

196B. Voluntary Control of Physiological Processes (1-4) I, II, III. Lorenz
Laboratory—3-12 hours. Prerequisite: course 196A; consent of instructor. Individual or team projects in voluntary control of physiological processes emphasizing application of microcomputer-assisted biofeedback techniques. May be repeated for credit with a maximum of 6 units for 196A-196B course sequence. (P/NP grading only.)

197T. Tutoring in Physiology (2) I, II, III. The Staff (Horowitz in charge)
Discussion—1 hour; tutorial—1 hour. Prerequisite: course 110 or 113 (with grade of B or better); consent of instructor. Extensive review of systemic physiology through leading a weekly tutorial session with a small group of students taking course 110. Course format will vary with background of tutors and instructional needs. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Horowitz in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Horowitz in charge)
(P/NP grading only.)

Graduate Courses

200L. Advanced General Physiology Laboratory (4) III. B. Wilson
Discussion—2 hours; laboratory—6 hours. Prerequisite: courses in undergraduate biochemistry, cell biology, or general physiology, or consent of instructor. Design, performance, and interpretation of experiments in cellular and general physiology with emphasis on somatic cells. Basics of cell culture and study of growth, differentiation, metabolism, morphology, and physiological regulation of animal cells *in vitro*.

212. Gastrointestinal Physiology of Single-Stomached Animals (3) II. Mendel
Lecture—3 hours. Prerequisite: course 114 or 120C; Biochemistry 101B or Physiological Chemistry 101B. Consideration of the physiological mechanisms, biochemistry and endocrinology of the gastrointestinal tract, pancreas and liver as they relate to the assimilation of food. Offered in odd-numbered years.

214. Neurophysiology (4) II. Carstens
Lecture—4 hours. Prerequisite: courses 112, 111B; consent of instructor. Electrical activity of neurons and neuroeffector junctions; physiology of the nervous system as studied by its electrical activity. Offered in odd-numbered years.

215. Neurophysiology Laboratory (3) I, Horowitz, Scobey
Discussion—3 hours; laboratory—9 hours. Prerequisite: course 214 (may be taken concurrently). Selected experiments based on modern concepts to illustrate in depth, surgical techniques, stimulating and recording techniques used in neurophysiology research.

216. Neurophysiology Literature (2) III.
Discussion—2 hours. Prerequisite: course 214. Critical reading and group discussion of current and classic original papers in neurophysiology.

217. The Vertebrate Eye (3) II. Sillman
Lecture—3 hours. Prerequisite: course 112 or the equivalent. The vertebrate eye will be considered from the standpoint of its physiology, biochemistry, and biology. Retinal functions and mechanisms will be stressed, with particular emphasis on the photoreceptors. Offered in even-numbered years.

218. Topics in Circulatory Pathophysiology (3) II. Weidner
Lecture—1 hour; discussion—2 hours. Prerequisite: course 113 (or the equivalent) or consent of instructor. Selected topic in circulatory or cardiopulmonary physiology will be addressed each offering. Topics will include pathophysiology. Lecture and discussion based on current research literature in the field. May be repeated with consent of instructor. Offered in odd-numbered years.

219. Muscle Growth and Development (3) II. B. Wilson, Bandman (Food Science and Technology)
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, Anderson, Stabenfeldt (Reproduction)
Lecture—3 hours. Prerequisite: courses 110, 110L; Biochemistry 101B; Genetics 100B. Basic phenomena of sexual and asexual reproduction and comparisons of processes in a wide variety of animals; gamete formation, structure, and metabolism; fertilization; neuroendocrine mechanisms in maturation and reproductive cycles; behavioral aspects.

221. The Ruminant Stomach (3) III. Colvin
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110L and Physiological Sciences 101B or Biochemistry 101B or consent of instructor. Ruminant stomach anatomy, histology, and physioloy. Original literature will be emphasized. Offered in odd-numbered years.

225. Physiology of Lactation (4) II. Baldwin
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110; Biochemistry or Physiological Sciences 101B. Consideration of the biochemical, genetic, physiological, nutritional and structural factors determinant of mammary gland development, lactogenesis and milk yields and composition; animal physiological adaptations to lactation; mammary cancer research; and, research perspectives in mammary research.

231. Neuroendocrinology (4) II. Woolley, Moberg
Lecture—3 hours; discussion—1 hour. Prerequisite: course 112 or 130, and consent of instructor. Neural-endocrine interactions; neural regulation of endocrine systems; hormonal modifications of neural development and activity. May be repeated for credit with consent of instructor when subject matter changed substantially.

234. Neurophysiological Basis of Neurotoxicology (3) I, Woolley
Lecture—24 hours; discussion—4 hour. Prerequisite: course 110 (or the equivalent), basic understanding of neurophysiology, and consent of instructor. Mechanisms of action of a number of different neurotoxins, including marine toxins, insecticides and heavy metals. Examples of ways toxins may act on the nervous system and techniques for study of neurotoxicology. (Same course as Environmental Toxicology 234.)

242. Physiological Rhythmicity (1) I, Winget
Lecture—1 hour. General aspects and basic mechanisms of biological rhythms; the importance of rhythm desynchronization in areas of pharmacology and space medicine; telemetry; mathematical methods; chronometry; tidal, lunar, and annual periods; periodic desynchronization. Offered in odd-numbered years.

***250. Development of Physiological Concepts: Selected Topics** (3) I. The Staff (Horowitz in charge)
Lecture—2 hours; discussion—1 hour. Historical development of physiology. Selected topics from ancient to modern times. Course may be repeated for credit when a different topic is studied. (S/U grading only.)

275. Neurohumoral Regulatory Mechanisms of Thermogenesis (3) II. Horwitz, Horowitz
Lecture—2 hours; discussion—1 hour. Prerequisite: course 100A (or the equivalent), Biochemistry/Physiological Chemistry 101A (or the equivalent), and consent of instructor. Designed for graduate and advanced undergraduate students, this course will examine thermogenic systems in homeotherms (primarily mammals) with respect to regulation (hormonal and central nervous control) and effector mechanisms (basis of heat generation at the target cell).

290. Seminar (1) I, II, III. The Staff (Horowitz in charge)
Seminar—1 hour. Discussion and critical evaluation of advanced topics and current trends in research. (S/U grading only.)

290C. Research Conference in Physiology (1) I, II, III. The Staff (Horowitz in charge)
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Presentation and discussion of faculty and graduate student research in physiology. May be repeated for credit. (S/U grading only.)

291A. Selected Topics in Visual Science (2) III Chalupa (Psychology), Johnson (Ophthalmology), Scobey (Neurology), Sillman
Seminar—2 hours. Prerequisite: graduate student standing and consent of instructor; course 217 recommended. Vision from the standpoint of physiology, biochemistry, morphology and psychophysics. Consideration of all levels of the visual system from periphery to highest brain centers. Emphasis on recent research. Topics vary each year. May be repeated for credit. (S/U grading only.)

291B. Seminar in Cellular Mechanisms of Adaptation (1) I, II, III. Horwitz
Discussion—4 hour; seminar—4 hour. Prerequisite: course 100B, Biochemistry 101B or Physiological Sciences 101B, and consent of instructor. Review and evaluation of current literature and research in cellular adaptations to the environment. May be repeated for credit when a different topic is considered. (S/U grading only.)

291C. Selected Topics in Cellular Physiology and Biochemistry (2) II. Sillman, Traut (Biological Chemistry)
Seminar—2 hours. Prerequisite: one course in biochemistry; course 100A or Zoology 121A or 121B. General physiology, cell biology and molecular biology of living systems, with emphasis on cell form and function. One topic, representing a timely and important area of research, will serve as the focus throughout the course. May be repeated for credit. (Same course as Biological Chemistry 291.)

291D. Research Approaches in Physiology (2) I. The Staff (Horowitz in charge)
Seminar—2 hours. Prerequisite: graduate standing in Graduate Group in Physiology or consent of instructor. Current research in Physiology. Overall design of experiments and particular research areas. (S/U grading only.)

297T. Tutoring in Physiology (3) I, II, III. The Staff (Horowitz in charge)
Discussion—1 hour; tutorial—2 hours. Prerequisite: completion of course to be tutored (with a grade of A) and consent of instructor. Advanced study of systemic physiology through leading small discussion groups in upper division courses (students are required to attend lectures in the course which they are tutoring). May be repeated for credit by tutoring in different courses or in the continuation of a course (e.g., courses 112, 113, 114). (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Horowitz in charge)

299. Research (1-12) I, II, III. The Staff (Horowitz in charge) (S/U grading only.)

Professional Course

300A-300B. Pedagogical Aspects of Physiology in Higher Education (3-3) I, II, III. The Staff (Horowitz in charge)
Lecture, discussion, or laboratory, or combination. Prerequisite: meet qualifications for teaching assistant in physiology. Participation as a teaching assistant for one quarter in a designated physiology course. Instruction in methods of leading discussion groups, leading laboratory sections, writing and grading quizzes, operation and use of laboratory equipment, and reading and grading laboratory reports. Course meets teaching requirements for Ph.D. program in Physiology. (S/U grading only.)

Physiology (A Graduate Group)

———, Chairperson of the Group

Group Office, 196 Briggs Hall (752-0204)

Graduate Study. The Graduate Group in Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information regarding these programs, address the Graduate Group Secretary at the above location.

Graduate Advisers. Consult Physiology Graduate Group Office.

Plant Pathology

(College of Agricultural and Environmental Sciences)

James E. DeVay, Ph.D., Chairperson of the Department

Department Office, 354 Hutchison Hall (752-0301)

Faculty

Richard M. Bostock, Ph.D., Assistant Professor
Edward E. Butler, Ph.D., Professor
Robert N. Campbell, Ph.D., Professor
James E. DeVay, Ph.D., Professor
John M. Duniway, Ph.D., Professor
W. Harley English, Ph.D., Professor Emeritus
David G. Gilchrist, Ph.D., Associate Professor
Austin C. Goheen, Ph.D., Adjunct Lecturer

NOTE: For key to footnote symbols, see page 123.

Raymond G. Grogan, Ph.D., Professor
Dennis H. Hall, Ph.D., Adjunct Lecturer
William B. Hewitt, Ph.D., Professor Emeritus
Clarence I. Kado, Ph.D., Professor
John M. Klisiewicz, Ph.D., Adjunct Lecturer
Tsune Kosuge, Ph.D., Professor
Lysle D. Leach, Ph.D., Professor Emeritus
Bert Lear, Ph.D., Professor
James D. MacDonald, Ph.D., Associate Professor *(Plant Pathology, Environmental Horticulture)*
James J. Marois, Ph.D., Assistant Professor
Srecko John M. Mircetich, Ph.D., Adjunct Lecturer
George Nyland, Ph.D., Professor
Joseph M. Ogawa, Ph.D., Professor
William C. Schnathorst, Ph.D., Adjunct Lecturer
William E. Timberlake, Ph.D., Professor
Robert K. Webster, Ph.D., Professor
Edward E. Wilson, Ph. D., Professor Emeritus

Related Major Program. See the major in Plant Science (page 289).

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 94.

Graduate Advisers. E. E. Butler, J. M. Duniway, T. Kosuge, R. K. Webster.

Courses in Plant Pathology

Upper Division Courses

120. Introduction to Plant Pathology (4) I, De Vay; III, Campbell
Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2; Bacteriology 2 recommended. The nature, cause, and control of plant diseases.

125. Diagnosis and Control of Plant Diseases (4) III. MacDonald
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 120. Clinical plant pathology with emphasis on diagnosis, epidemiology, and control of diseases of economic plants. Students may specialize in diseases of fruits, vegetables, field crops, or ornamentals in the laboratory exercises.

130. Physiology of Fungi (3) I, Gilchrist, Kosuge
Lecture—3 hours. Prerequisite: Botany 2; Biochemistry 101B and Botany 119 recommended. Discussion of the nature and interrelationships of fungal cell structure, growth, spore germination, nutrition, and metabolism with emphasis on responses of fungi to environmental changes. Selected examples of beneficial and destructive roles of fungi will also be considered.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: course 120 and consent of instructor. Work-learn experience off and on campus, supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

205A-205B. Diseases of Vegetable and Field Crops (2-2) III-Extra-session summer. Grogan, Webster
Lecture—2 hours and laboratory—6 hours (alternate weeks through first Summer Session). Prerequisite: course 120; Botany 119. Study of vegetable and field crops diseases with emphasis on recognition and diagnosis, etiology, epidemiology, and control. (Deferred grading only, pending completion of course.) Course 206 may be taken concurrently.

206A-206B. Diseases of Fruit, Nut, and Vine Crops (3-1) III-Extra-session summer. Ogawa
Lecture—2 hours and laboratory—6 hours (alternate weeks through first Summer Session). Prerequisite: course 120; Botany 119. Clinical study of fruit, nut, and vine crops diseases with emphasis on etiology, epidemiology, diagnosis, and control. (Deferred grading only, pending completion of course.) Course 205 may be taken concurrently.

208. Ecology of Plant Pathogens and Epidemiology of Plant Disease (4) I, Duniway
Lecture—3 hours; discussion—1 hour; outside work or term paper. Prerequisite: course 120 or the equivalent. Interaction between higher plants, plant pathogens, and the environment which is important in the occurrence and severity of plant disease. Emphasis is placed on the population dynamics and ecology of plant pathogens in the aerial and soil environment.

209. Principles of Plant Disease Control (3) II. Bostock
Lecture—3 hours. Prerequisite: course 120 or the equivalent. Discussion of the underlying principles and methods used for the control of plant diseases. Emphasis placed on application of epidemiological principles, biological (including host resistance), and chemical strategies to achieve disease control.

210. Physiology and Biochemistry of Host-Pathogen Interaction (4) II. Kosuge, Gilchrist
Lecture—3 hours; discussion—1 hour. Prerequisite: course 130 or the equivalent; Biochemistry 101B. Discussion of the nature of host-pathogen interactions, metabolic alterations in plant disease, biochemistry of disease resistance, toxins in plant disease.

215. Genetics of Plant Pathogens (4) II. Webster
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 120; Genetics 100B; Botany 119. Study of fundamental concepts, research techniques and current information on the genetics of plant pathogenic microorganisms; origin and determination of physiologic specialization, host resistance and virulence in the pathogen as related to the host-parasite interaction. Special emphasis on the fungi. Offered in odd-numbered years.

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. The Staff (Chairperson in charge)
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.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Review and evaluation of current research in plant pathology. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: course 120 or consent of instructor. Presentation, evaluation, and critical discussions of research activities in the area of advanced plant pathology; primarily designed for graduate students. (S/U grading only.)

291. Seminar in Host-Parasite Physiology (1) I, II. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: course 120. Review and evaluation of current literature and research in host-parasite physiology. (S/U grading only.)

292. Seminar in Plant Virology (1) III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: course 226. Review and evaluation of current literature and research in virology. (S/U grading only.)

295. Seminar in Mycology (1) I, Butler; III, Wells
Seminar—1 hour. Review and evaluation of current literature and research in mycology. (S/U grading only.) (Same course as Botany 295.)

298. Special Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Plant Physiology

See Botany for undergraduate majors, and below for graduate study.

Plant Physiology (A Graduate Group)

John M. Labavitch, Ph.D., Chairperson of the Group
Group Office, 152 Robbins Hall (752-7094)

Faculty

Includes 85 faculty members from eleven departments in two colleges.

Graduate Study. The Graduate Group in Plant Physiology offers programs leading to the M.S. degree with two options, I (Thesis) or II (Comprehensive Examination), and the Ph.D. degree.

Preparatory Work. A level of scholastic development equivalent to a baccalaureate degree in Biological Sciences is required. This includes coursework in general botany, chemistry, physics, mathematics through calculus, including statistics, anatomy (or morphology), biochemistry, genetics, and introductory plant physiology. Limited deficiencies in these areas can be made up after admission to the graduate program.

Units required for the **M.S. degree** are described in the Announcement of the Graduate Division. Minimum additional required coursework includes two quarters of advanced plant physiology.

General requirements for the **Ph.D. degree** include graduate-level advanced plant physiology, biometry experimental design quantitative skills, and physical chemistry. A minimum number of units of seminar and laboratory experience is specified. The subject matter of the required Qualifying Examination includes, in addition to plant physiology, such areas as general botany, plant anatomy and morphology, and plant biochemistry, emphasizing their pertinence to the student's area of specialization. A thesis prepared under the supervision of any faculty member of the Group must be submitted, and the findings must be presented as a seminar.

Graduate Advisers. Adviser information is available from the Group Office.

Related Courses. See course listings for Agronomy, Biochemistry and Biophysics, Botany, Environmental Horticulture, Environmental Toxicology, Food Science and Technology, Land, Air and Water Resources (Atmospheric Science, Resource Sciences, Soil Science, Water Science), Plant Pathology, Pomology, Vegetable Crops, and Viticulture and Enology.

Courses in Plant Physiology

Graduate Courses

208. Plant Hormones and Regulators (3) II. Labavitch (Pomology)
Lecture—3 hours. Prerequisite: Botany 111B. Chemistry, biochemistry and physiological activity of major classes of natural plant growth regulators. Primary consideration given to concepts that are of current research interest. Growth regulators in agriculture. Offered in odd-numbered years.

290. Faculty Seminar (1) I, Kliewer (Viticulture and Enology)
Seminar—2 hours. Seminars presented by members of Plant Physiology faculty, describing their areas of research. (S/U grading only.)

297T. Tutoring Plant Physiology (1–5) I, II, III. The Staff
Tutorial—3–15 hours. Offers graduate students, particularly those not serving as teaching assistants, the opportunity to gain teaching experience. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson 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 (Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

Plant Protection and Pest Management (A Graduate Group)

Albert A. Grigarick, Jr., Ph.D., Chairperson of the Group
Group Office, 367 Briggs Hall (752-0475)

Graduate Study. The Graduate Group in Plant Protection and Pest Management offers programs of study and research leading to the M.S. degree. Detailed information can be obtained from the Group Chairperson and the *Graduate Announcement.*

Graduate Adviser. O. G. Bacon (Entomology).

Courses in Plant Protection and Pest Management

Graduate Courses

201. Concepts and Systems of Plant Protection and Pest Management (3) II.
Lecture—2 hours; discussion—1 hour. Prerequisite: Entomology 110 or 112. Plant Pathology 120, Botany 120 (may be taken concurrently), Nematology 100; Botany 117 or Zoology 125 recommended. Ecological perspective of agricultural systems, the role of pests in these systems, plant protection and pest management methods as modifiers of the systems and their components.

202A-202B-202C. Diagnosis of Plant Pest Problems and the Control of Causal Agents (3-3-3) I, Norris (Botany); II, —— (Plant Pathology); III. Bacon (Entomology)
Fieldwork—9 hours. Prerequisite: Entomology 110 or 112, Plant Pathology 120, Botany 120, Nematology 100 (Botany or Nematology may be taken concurrently). Diagnosis of problems and assessment of losses caused by insects, pathogens, weeds, nematodes, and other pests; methods of determining infestation levels and establishing economic thresholds, and control of these pests with emphasis on integration of available management practices into programs.

290. Seminar (1-2) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
(S/U grading only.)

Plant Science

(College of Agricultural and Environmental Sciences)

Faculty

For faculty in departments offering areas of specialization (Depth Subject Matter) in Plant Science, see under Departments of Agronomy and Range Science; Botany; Environmental Horticulture; Plant Pathology; Pomology; Vegetable Crops; and Viticulture and Enology.

The Major Program

The objective of the Plant Science major is to train students in the biological and natural sciences as applicable to the technology required for the production, protection, and maintenance of crop plants, and their quality following harvest.

The Plant Science student may choose to specialize in one of the seven departmentally associated options or may choose general education by electing the general Plant Science option. The option selected will be identified immediately following the name of the major, Plant Science, on the transcript.

The Master Adviser serves as adviser for all students who opt for the Plant Science major. Following commitment to one option, the student is assigned to an adviser associated with the department offering expertise in that area.

Upon graduation, students may qualify for a career in their area of specialization or for advanced study leading to the M.S. or Ph.D. degrees. Each of the (UCD) Departments of Agronomy, Plant Pathology, and Vegetable Crops offer an M.S. degree in their respective fields, while the M.S. degree in Horticulture is available through the Departments of Environmental Horticulture, Pomology, and Viticulture and Enology.

Occupational opportunities exist in nursery and green house management, farming, technical and sales positions in agricultural business and associated enterprises, such as banking and equipment and supply companies, as well as in private, state and federal service in consulting and research.

Plant Science

B.S. Major Requirements:

(For convenience in program planning the courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses may be taken with your adviser's approval. *Courses shown without parentheses are required.)*

	UNITS
Common Core Courses	**85-88**
English (English 1, 2, 20 or 103)	4
Rhetoric (Rhetoric 1, 3, Philosophy 5)	4
Economics (Economics 1A or 1B)	5
Physics (Physics 1A, 1B)	6
Statistics (Agricultural Science and Management 150)	4
General chemistry (Chemistry 1A, 1B)	10
Organic chemistry (Chemistry 8A, 8B)	6
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Plant science (Plant Science 2)	4
Soil science (Soil Science 100)	4
Weed science (Botany 120)	3
Entomology (Entomology 110 or 112)	4
Plant pathology (Plant Pathology 120)	4
Plant physiology (Botany 111A, 111B)	6
Genetics (Genetics 120 or 100A-100B)	4-6
Plant nutrition (Plant Science 135)	4
Water science (Water Science 104 or 110)	3-4
Depth Subject Matter	**45-55**

Agronomy Option

Specific course requirements	20-21
Agronomy 100, 100L	5
Agronomy 111, 112, 113 (any two courses)	7-8
Plant Science 101	4
Soil Science 109	4
Additional courses to be selected with consent of the adviser from the following	24-25

Agricultural Economics 130, 140, 150; Agricultural Engineering Technology 102, 103, 104, 105; Agricultural Practices 49A, 49B; Animal Science 2, 114, 116; Atmospheric Science 105; Nematology 100, 110; Plant Pathology 125; Plant Science 102, 103, 113; Soil Science 102, 120, 122, 150; Water Science 103, 111, 172.

Courses offered in other production departments (e.g., Vegetable Crops, Pomology, Viticulture and Enology, etc.) or in Range Science may be selected in consultation with adviser to satisfy specific individual goals.

Natural sciences electives, not to exceed 8 units, may also be included.

Floriculture/Nursery Management Option

Specific course requirements	28
Environmental Horticulture 6, 105, 120, 125, 126, 133	20
Plant Science 102, 109	8
Additional courses to be selected with consent of the adviser from the following	17

Agricultural Economics 18, 112, 113, 114; Agricultural Engineering Technology 114; Agronomy 100; Bacteriology 3; Botany 105, 111L; Economics 11A, 11B; Environmental Horticulture 107, 115, 130, 155; Geography 3; Landscape Architecture 40, 131; Plant Pathology 125; Plant Science 101, 112, 112L, 113; Pomology 102; Psychology 144; Soil Science 109; Vegetable Crops 101; Viticulture and Enology 116A.

Courses offered in the natural sciences may be selected in consultation with adviser.

Landscape Horticulture Option

Specific course requirements	31
Environmental Horticulture 6, 105, 120, 130, 133, 155	20
Landscape Architecture 40, 131	7
Plant Science 102	4
Additional courses to be selected with consent of the adviser from the following	14

Agricultural Economics 18, 112, 114, Agronomy 100; Botany 105; Economics 11A, 11B; Environmental Horticulture 107, 115, 125, 126; Environmental Planning and Management 144; Geography 3; Landscape Architecture 111; Plant Pathology 125; Plant Science 101, 109, 113; Pomology 101; Soil Science 109; Vegetable Crops 101; Wildlife and Fisheries Biology 10.

Courses offered in the natural sciences may be selected in consultation with adviser.

Plant Pathology Option

Specific course requirements	46
Bacteriology 2, 3	4
Biochemistry 101A, 101B	6
Botany 105, 119	10
Chemistry 1C, 5	9
Mathematics 16A, 16B	6
Nematology 100	4
Plant Pathology 125, 130	7

Plant Science Option

Specific course requirements	52-55
Calculus (Mathematics 16A, 16B)	6
Plant science (Plant Science 101, 102, 109, 113, 122)	11
Agricultural economics (Agricultural Economics 18, 113, 120, 130, 140, 150)	3-5
Agronomy (Agronomy 100, 100L)	5
Environmental horticulture (Environmental Horticulture 6, 105, 125, 130)	3-4
Pomology (Pomology 101, 102)	4
Vegetable crops (Vegetable Crops 101)	4
Viticulture (Viticulture 100)	3
Biochemistry (Biochemistry 101A, 101B)	6
Environmental toxicology (Environmental Toxicology 101)	3
Soils (Soil Science 109)	4

Pomology Option

Specific course requirements	15
Pomology 101, 102	8
Plant Science 109, 112	7
Additional courses to be selected with consent of the adviser from the following	30

Agricultural Economics 112, 114, 140; Agricultural Engineering Technology 101; Agronomy 100, 100L; Atmospheric Science 105; Entomology 119, 119L; International Agricultural Development 101; Nematology 100, 110; Plant Pathology 125, 130; Plant Science 101, 102, 112, 112L, 113; Pomology 3; Soil Science 102, 109, 121, 150; Vegetable Crops 101, 118; Viticulture and Enology 116A, 116B; Water Science 111

Natural sciences electives, not to exceed 8 units, may also be included.

Vegetable Crops Option

Specific course requirements	14-15
Vegetable Crops 101	4
Soil Science 109	4
Additional units from Vegetable Crops 105, 118, 150, or Plant Science 112	6-7

Additional courses to be selected with consent of the adviser from the following | 30-31

Agricultural Economics 112, 114, 140; Agronomy 100, 111, 113; Biochemistry 101A, 101B, 101L; Geography 3; Nematology 110; Plant Science 102, 103, 109, 112L, 113; Soil Science 102, 111, 150; Vegetable Crops 195, 198, 199.

Natural sciences electives, not to exceed 8 units, may also be included.

NOTE: For key to footnote symbols, see page 123.

Viticulture Option

Specific course requirements 15
Viticulture and Enology 3, 100, 105, 116A, 116B 15
Additional courses to be selected with consent of the adviser from the following 30

Agricultural Economics 130, 140; Agricultural Engineering Technology 101; Agricultural Practices 49A, 49B; Atmospheric Sciences 105; Geography 3; Nematology 110; Plant Physiology 208; Plant Science 101, 102, 103, 109, 113; Soil Science 102, 109, 150; Viticulture and Enology 123, 124, 126; Water Science 111.

Natural sciences electives, not to exceed 8 units may also be included.

Unrestricted Electives 37-50

Total Units for the Major 180

Major Adviser. See the Class Schedule and Room Directory.

Advising Center for the major is located in 258 Hunt Hall (752-1715).

Related Courses. See under Agronomy, Environmental Horticulture, Plant Pathology, Pomology, Vegetable Crops, and Viticulture and Enology.

Courses in Plant Science

Questions pertaining to the following courses should be directed to the instructor or to the Advising Center (see above).

Lower Division Courses

2. Production of Cultivated Plants (4) I, III. The Staff
Lecture—1 hour; discussion—1 hour; laboratory—3 hours; V.A.S.T.—2½ hours. Principles of plant production, improvement, propagation, harvesting, preserving, processing and marketing. Course will proceed by the Video-Audio-Self-Tutorial method with students making use of the learning facilities at their own convenience.

***10. Plants and Man** (3) I. The Staff
Lecture—3 hours. Prerequisite: high school biology, chemistry and physics are essential. Plants as a basic resource for food, fiber, shelter, recreation and environmental enhancement. Emphasis is placed on food and fiber production and the many uses of plants by man.

92. Plant Science Internship (1-6) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-18 hours. Prerequisite: consent of instructor. Work-learn experience off or on campus in all subject areas pertaining to plant science. Internships supervised by a member of the faculty. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Department Chairperson in charge)
Group study of selected topics. Restricted to lower division students. (P/NP grading only.)

Upper Division Courses

101. Ecology of Crop Systems (4) II. Loomis (Agronomy and Range Science)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 and Soil Science 100, or consent of instructor. Ecological processes governing the structure and behavior of managed ecosystems. Emphasis on mechanistic and systems views of the physical environment, photo synthetic productivity, competition, adaptation, nutrient cycling, energy relations and contemporary issues such as climate change.

102. Physiology of Cultivated Plants (4) II. Sachs (Environmental Horticulture), Martin (Pomology)
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 (Agronomy and Range Science)
Lecture—2 hours; discussion—1 hour (a few sessions will be used for laboratory work on plant materials). Prerequisite: course 10; 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.

***107L. Plant Cell, Tissue, and Organ Culture** (5) III. The Staff (Pomology)
Lecture—2 hours and laboratory—6 hours (intensive 5-day session); seminar—1 hour and research projects. Prerequisite: Botany 111A, 111B (may be taken concurrently); consent of instructors. Basic and applied aspects of plant tissue culture methodology with emphasis on quantification. Intensive one-week methodology section will be conducted before Spring Quarter, but can extend into the first week of instruction. Application of methodology will extend throughout the quarter with weekly seminars and individual research projects.

109. Plant Propagation (4) II. Sutter, Kester (Pomology)
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 2 or Botany 2 or consent of instructor. Principles and practices of propagating plants with emphasis on anatomical and physiological relationships.

112. Postharvest Physiology and Handling of Horticultural Commodities (3) I, Kader (Pomology), Reid (Environmental Horticulture), Saltveit (Vegetable Crops)
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, Kader (Pomology), Reid (Environmental Horticulture), Saltveit (Vegetable Crops)
Discussion—1 hour; laboratory—3 hours. Prerequisite: course 112 (may be taken concurrently). Demonstrations and exercises following the subject matter of course 112. One or more field trips to observe commercial practices.

113. Plant Breeding (4) II. Hewitt (Vegetable Crops)
Lecture—3 hours; demonstration-discussion—2-3 hours. Prerequisite: Genetics 100B or 120 or enrollment in both concurrently. The principles of plant breeding applied to economic crops.

122. Physiological Genetics of Crop Plants (3) II. Jones (Vegetable Crops)
Lecture—3 hours. Prerequisite: Genetics 100A or 120; Botany 111A, 111B; or consent of instructor. Principles and recent advances in the physiological genetics of plants. Plant developmental processes related to yield will be considered at several levels; genetic control, biochemical regulation and the impact of the environment on development of plants.

126. Physiology of Environmental Stresses in Plants (3) II. Läuchli (Land, Air and Water Resources)
Lecture—2 hours; discussion—1 hour. Prerequisite: Botany 111B (may be taken concurrently) or the equivalent. Principles and selected topics in physiology of environmental stresses in plants. Areas emphasized are general stress concepts, physiological responses of plants to selected environmental stresses and integration of stresses.

130. Plant Growth Kinetics (4) III. Silk (Land, Air and Water Resources)
Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 2, Mathematics 16A, 16B; Botany 105 recommended. Topics include growth curves, developmental indices, growth of the plant axis, leaf expansion, phyllotaxis, and growth of the apex. In laboratory, students plant seeds and use methods described in lecture to analyze quantitative aspects of plant development.

135. Mineral Nutrition of Plants (4) III. Epstein (Land, Air and Water Resources, Botany)
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. (Same course as Botany 135.)

170. Reproductive Biology of Flowering Plants (3) I, Wu (Environmental Horticulture)
Lecture—2 hours; discussion—1 hour. Prerequisite: Genetics 100A, 100B, or 120, or the equivalent. Emphasis on the genetic and physiological basis of reproductive development in flowering plants. Effect of these mechanisms on genetic variation, evolution and agricultural practices.

192. Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off or on campus in all subject areas pertaining to Plant Science. Internships supervised by a member of the faculty. (P/NP grading only.)

196. Postharvest Technology of Horticultural Crops (3) III. Kader (Pomology) in charge
Lecture-discussion-demonstration—5 days; field trip—5 days. Prerequisite: upper division or graduate student standing. Intensive study of current procedures for postharvest handling of fruits, nuts, vegetables, and ornamentals in California. Scheduled first two weeks immediately following last day of Spring Quarter. Considered a Spring course for preenrollment. (P/NP grading only.)

197T. Tutoring in Plant Science (1-4) I, II, III. The Staff
Prerequisite: upper division standing; completion of course being tutored or the equivalent. Leading discussion sections, conducting laboratory exercises or proctoring in personalized-system-of-instruction-format classes under faculty guidance. May be repeated once for credit if different course is tutored. (P/NP grading only.)

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

Graduate Courses

202. Advanced Physiology of Cultivated Plants (2) I. Sachs (Environmental Horticulture), Labavitch (Pomology)
Lecture—1 hour; discussion—1 hour; term paper. Prerequisite: courses 101 and 102; Botany 111A-111B. Selected physiological topics affecting crop production and quality. (P/NP grading only.) Offered in even-numbered years.

216. Advanced Topics in Mineral Nutrition (4) III. Läuchli (Land, Air and Water Resources)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 135 or consent of instructor. Cellular compartmentation of mineral elements, new methods and results; selected topics in absorption, translocation, metabolism and function of mineral elements; nutrition and transport in plants adapted to special nutrient environments.

221A-221B. Applied Crop Physiology (4-4) II-III. Bloom (Vegetable Crops)
Lecture—1 hour; seminar—1 hour; laboratory—6 hours. Prerequisite: courses 101 and 102 or Botany 111A-111B or consent of instructor. Research methods in applied plant physiology with examples drawn primarily from agronomic and vegetable crops. Field and laboratory projects, data reduction, and preparation of suitable reports.

291. Seminar in Postharvest Biology (1) I, II, III. Romani (Pomology) in charge
Discussion—1 hour. Prerequisite: consent of the instructor; open to advanced undergraduates. Intensive study of selected topics in the Postharvest Biology of fruits, vegetables and ornamentals. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
To be arranged.

Political Science

(College of Letters and Science)

Randolph M. Siverson, Ph.D., Chairperson of the Department

Department Office, 227 Voorhies Hall (752-0966)

Faculty

Lawrence Berman, Ph.D., Associate Professor
Edmond Costantini, Ph.D., Professor
William K. Domke, Ph.D., Assistant Professor
George W. Downs, Jr., Ph.D., Associate Professor *(Political Science, Administration)*
Philip L. Dubois, Ph.D., Associate Professor
Richard W. Gable, Ph.D., Professor
Alexander J. Groth, Ph.D., Professor
Charles M. Hardin, Ph.D., Professor Emeritus
Stuart L. Hill, Ph.D., Assistant Professor
Clyde E. Jacobs, Ph.D., Professor Emeritus
Bruce Jentleson, Ph.D., Assistant Professor
Joyce K. Kallgren, Ph.D., Professor
Dale Rogers Marshall, Ph.D., Professor
Lloyd D. Musolf, Ph.D., Professor
John R. Owens, Ph.D., Professor
Larry I. Peterman, Ph.D., Professor
Donald S. Rothchild, Ph.D., Professor
Randolph M. Siverson, Ph.D., Professor
Alvin D. Sokolow, Ph.D., Professor
Larry L. Wade, Ph.D., Professor
Geoffrey A. Wandesforde-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

NOTE: For key to footnote symbols, see page 123.

change and stability, parties, pressure groups, bureaucracies, administrative behavior, justice, national security, and international affairs.

The Department of Political Science offers two major programs: Political Science and Political Science—Public Service. Both provide students with preparation for subsequent careers as well as with a better understanding of politics in general and of the political systems in which they live.

The major in Political Science aims to provide a broad understanding of political concepts and values, political institutions, political behavior and political processes. It offers excellent preparation and background for later careers in government, politics, law, journalism, business, urban planning, administration and teaching.

The Political Science—Public Service major is designed for students who have a specific interest in a career or other activities in or around government. This undergraduate program can also serve as preparation for enrollment in graduate and professional schools. The major combines regular coursework in political science and related fields with two quarters of public affairs internship for which academic credit is granted. It differs from the regular Political Science major in having the internship as a requirement and in emphasizing upper division course work in functional and substantive policy areas of American Government. The functional areas are policy formulation, implementation, and interpretation and the substantive policy areas include urban, environmental, or others designed by the student and faculty counselors. Courses taken in other departments, for example, Economics, Environmental Studies, Environmental Planning and Management, may also be used to satisfy the major.

Political Science

A.B. Major Requirements:

UNITS

Preparatory Subject Matter **19-20**
Three courses from Political Science 1, 2 or 2D, 3 or 3D, 4 or 4D, 5 or 5D or 7 11-12
(Course 7 may not be taken if course 5 or 5D is taken.)
Two courses from History 3, 4A, 4B, 4C, 5, 10, 111A, 111B, 111C, 121A, 121B, 121C, 131A, 131B, 131C, 133, 134A, 134B, 145A, 145B, 146A, 146B, 147A, 147B, 147C, 151A, 151B, 151C, 151D 8

Depth Subject Matter **36**
Select two courses in each of three fields, listed below. The fields must be chosen from at least two Groups, A, B, or C 24
Group A
(1) Political theory: Political Science 111-119
Group B
(2) American government: Political Science 100-109, 172-175, 191, 195
(3) Parties and political behavior: Political Science 160-171
(4) Public law: Political Science 150-159
(5) Public administration: Political Science 180-189
Group C
(6) Comparative government: Political Science 126, 140-149, 177-179
(7) International relations: Political Science 120-139
Additional upper division units in political science to achieve a total of 36 12

Only 5 units of Political Science 192 (internship) may be counted towards the 36-unit requirement; and Political Science 192A *or* 192B may not be counted toward a field requirement.

Total Units for the Major **55-56**

Political Science—Public Service

A.B. Major Requirements:

UNITS

Preparatory Subject Matter **11-12**
One course from Political Science 1, 5, 5D or 7 ... 3-4
Two courses from Political Science 2 or 2D, 3 or 3D, 4 or 4D 8
Recommended: Economics 1A-1B.

Depth Subject Matter **48**
Core program 12

Two courses chosen from Political Science 100, 104, 105, 106, 113, 180, 181; and one course from Political Science 108, 109, 114.

Internship, Political Science 192A, 192B 10
Research paper, Political Science 193 2
Fields of concentration 24
Select six upper division courses from two or three fields of concentration listed below with at least two courses in each field selected; at least 16 of the units must be in political science. (Core Program courses may not be counted toward this requirement.)

Total Units for the Major **59-60**

Fields of Concentration
(1) Policy formulation:
Political Science 103, 105, 106, 108, 109, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 173, 174, 175, 195; Economics 130.
(2) *Policy implementation and evaluation:*
Political Science 156, 180, 181, 182, 183, 186, 187, 188, 189; Economics 131.
(3) *Policy interpretation—Substance and procedures (public/pre-law):*
Political Science 151, 152, 153, 156, 157A-157B, 158, 159.
(4) *Policy areas:*
a) Urban policy and implementation:
Political Science 100, 101, 102, 191; Economics 125A-125B; Environmental Planning and Management 110; Environmental Studies 173.
b) Environmental policy and implementation: Political Science 107, 172; Economics 123; Environmental Planning and Management 125; Environmental Studies 160, 161, 166, 168A-168B, 179.
c) ——— policy and implementation:
open field that might include courses relevant to health care, welfare, education, community development, transportation, science and technology, etc. (requires approval of Public Service adviser).

Major Advisers. Consult Departmental Office.

Minor Program Requirements:

Students electing a minor in Political Science may choose one of two plans:

UNITS

Political Science **24**
Plan I: Upper division units in political science (may include 4 units of lower division course work) distributed among at least two of the three Groups, A, B, and C, designated in the general Political Science major 24
Plan II: Upper division units in political science, with the approval of the minor adviser 24
This plan does not require a distribution of courses in any particular group inasmuch as the courses chosen will be those most appropriate to the student's academic major.

Teacher Credential Subject Representative. Consult Departmental Office. See page 98 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.

Public Affairs Internship Program. This program is open to upper division students in any major who want to obtain an internship in the area of government and public service. Information and application is available from the Intern Coordinator, Political Science Department, 228 Voorhies Hall, 752-1989.

American History and Institutions.

This University requirement may be satisfied by passing any one of the following Political Science courses: 1, 5, 5D, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 130, 131, 160, 163. (See also page 61.)

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, III. The Staff
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. 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 3. Selected problems in International Relations. Individual or team research projects will be required.

4. Basic Concepts in Political Theory (4) III. Peterman, Zetterbaum
Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 4D. Analysis of such concepts as the individual, community, liberty, equality, justice, and natural law as developed in the works of the major political philosophers.

***4D. Seminar in Basic Concepts of Political Theory** (4) III. Peterman, Zetterbaum
Seminar—2 hours. Seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 4. Analysis of such concepts as the individual, community, liberty, equality, justice, and natural law as developed in the works of major political philosophers. individual or group research projects will be required.

5. Contemporary Problems of the American Political System (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: not open to students having credit for course 5D. In-depth treatment of selected problems and issues of American politics, governmental institutions, and policies.

***5D. Seminar in Contemporary Problems of the American Political System** (4) III. The Staff
Seminar—2 hours; seminar sections or student-faculty conferences—2 hours. Prerequisite: open to lower-division students with consent of instructor; not open to students having credit for course 5. In-depth treatment of selected problems and issues of American politics, governmental institutions, and policies. Individual or group research projects will be required.

7. The American Legal System (3) II. The Staff
Lecture-discussion—3 hours. Prerequisite: sophomore standing recommended. The law, the courts, and the lawyers. The organization and power of American courts. Public and private law as instruments of policies. The role of lawyers in the American legal system. Offered in even-numbered years.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

Upper Division Courses

100. Local Government and Politics (4) II. Sokolow
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor. Politics and government of local communities in the United States, including cities, 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—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Political and economic relationships among central cities, suburbs, and regional, state, and federal governments. Focuses upon policy areas such as poverty, transportation, welfare, and housing, and upon who governs and who benefits from the policies in these areas.

***103. Comparative State Government and Politics** (4) II. Sokolow
Lecture—3 hours; discussion—1 hour. 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, III. 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) III. Owens
Lecture—3 hours; discussion—1 hour. Analysis of the legislative process with emphasis on the United States Congress; legislative organization and procedures, legislative leadership and policy making, legislators and constituents, relations between Congress and other agencies.

106. The Presidency (4) I, Berman
Lecture—3 hours; discussion—1 hour; optional term paper. The American presidency's origins and development; presidential power and influence as manifest in relationships with Congress, courts, parties, and the public in the formulation and administration of foreign and domestic policy; nominations, campaigns, and elections.

107. Environmental Politics and Administration (4) I, Wandesforde-Smith
Lecture—3 hours; discussion—1 hour. Introduction to the environment as a political issue in the United States and to the development of administrative mechanisms for handling environmental problems. Changing role of Congress, the presidency, the bureaucracy, and the courts in environmental policy formulation and implementation.

108. Policy Making in the Public Sector (4) II. Downs
Lecture—3 hours; research paper. The theoretical rationale for governmental activity, program evaluation, PPBS, positive theories of policy making, the quantitative study of policy determinants, implementation, and proposals for improved decision making.

109. Public Policy and the Governmental Process (4) III. Wade
Lecture—3 hours; research paper. The processes of formulating public policy, including individual and collective decision making, political exchange, competition, bargaining, coalition formation and the allocation of public goods, resources and opportunities.

111. Systematic Political Science (4) I, 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. Major contemporary attempts to reformulate traditional democratic theory; attempts to replace traditional theory by conceptual models derived from modern social science findings. Offered in odd-numbered years.

113. American Political Thought (4) I, Peterman
Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Origins and nature of American political thought. Principles of American thought as they emerge from the founding period to the present.

***114. Quantitative Analysis of Political Data** (4) III. The Staff
Lecture—3 hours; term paper. Logic and methods of analyzing quantitative political data. Topics covered include central tendency, probability, correlation, and non-parametric statistics. Particular emphasis will be placed on understanding the use of statistics in political science research. Offered odd-numbered years.

***115. Medieval Political Thought** (4) II. Peterman
Lecture—3 hours; term paper. Prerequisite: course 118A. Examination of the ideas central to medieval political thinking. Emphasis will be upon the thoughts of the major political thinkers of the period, rather than upon political history.

***116. Foundations of Political Thought: A Study in Depth of a Major Political Philosopher** (4) III. Peterman, Zetterbaum
Lecture-discussion—3 hours; term paper. Intensive analysis and evaluation of the seminal works of a major political philosopher.

117. Marxism (4) II. Zetterbaum
Lecture—3 hours; discussion—1 hour. Examination of the political and social philosophy of Karl Marx, with reference to the evolution of Marxism in the nineteenth and twentieth centuries.

118A. History of Political Theory (4) I, Peterman
Lecture—3 hours; term paper. Critical analyses of the works of major political philosophers. Classical and medieval political philosophy—Plato, Aristotle, Cicero, St. Thomas.

118B. History of Political Theory (4) II. Peterman
Lecture—3 hours; special assignments. Critical analyses of the works of major political philosophers. Modern political philosophy—Machiavelli, Hobbes, Locke, Rousseau, Burke.

***118C. History of Political Theory** (4) III. Zetterbaum
Lecture—3 hours; term paper. Critical analyses of the works of major political philosophers. Nineteenth and twentieth centuries: Hegel, Tocqueville, Mill, Marx, Nietzsche, Sartre.

119. Modern Political Thought (4) III. Zetterbaum
Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Study in depth of philosophers considered central to modern political thought, especially nineteenth and twentieth century political thought. Emphasis will be upon an individual philosopher or concept rather than upon a survey of modern political thought.

120. Theories of International Politics (4) II. Jentleson
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor. Major contemporary approaches to the study of international politics, including balance of power, game theory, Marxist-Leninist theory, systems theory, and decision-making analysis.

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) II. The Staff
Lecture—4 hours. Selected topics in international law; territory, sovereign immunity, responsibility, the peaceful settlement or nonsettlement of international disputes.

123. The Politics of Interdependence (4) II. Domke
Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. In the past several decades, growing economic interdependence has generated new problems in international relations. Course deals with difficulties in managing complex interdependence and its implication on national policies and politics.

124. The Politics of Global Inequality (4) III. Jentleson
Lecture—3 hours; term paper. Prerequisite: upper division standing; course 123 recommended. Long-standing division of the global system into richer and poorer regions poses many important problems in international political economy. Course presents a theoretical background to North-South issues and analyses of current problems in economic and political relations.

126. Ethnic Self-Determination and International Conflict (4) III. Rothchild
Lecture—3 hours; individual meetings with students to discuss term papers. Prerequisite: one international relations course recommended. Compares the claims of the state and ethnic peoples in countries undergoing internal conflicts, e.g., South Africa, Northern Ireland. Analyzes the role of the international community in facilitating the peaceful resolution of conflicts.

***127. Nationalism and Imperialism** 4) II. Kallgren
Lecture—4 hours. Prerequisite: upper division standing; course 3 recommended. Theory of nation building illustrated by Western and non-Western experience. Offered in even-numbered years.

128. International Communism (4) II. Zinner
Lecture—4 hours. Prerequisite: upper division standing; course 2 or 2D or 3 or 3D, or consent of instructor. International communist movement; idealogy 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.

129. Special Studies in International Politics (4) I, II, III. The Staff
Lecture—3 hours; term paper. Prerequisite: upper division standing. Intensive examination of one or more special problems in international politics. May be repeated once for credit when different topic is studied.

130. Recent U.S. Foreign Policy (4) I, Jentleson
Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. Broad survey of the development of U.S. foreign policy in twentieth century with emphasis on transformation of policy during and after World War II, and the introduction to analytic tools and concepts useful for understanding of current foreign policy issues.

131. Analysis of U.S. Foreign Policy (4) II. Jentleson
Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. Detailed presentation and examination of the formulation of execution of U.S. foreign policy. Survey of numerous factors influencing policy outcomes and how such determinants vary according to policy issue areas.

132. National Security Policy (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: upper division standing. Development of national security policies since 1945. Analysis of deterrence and assumptions upon which it is based. Effects of nuclear weapons upon conduct of war, alliance systems, and the international system. Prospects of security and stability through arms control.

***133. The American Role in East Asia** (4) I, Kallgren
Lecture—4 hours. Prerequisite: upper division standing; course 3 recommended. Survey of the role the United States has played in East Asia. Influence on Asian westernization of U.S. governmental East Asian policy, missionaries, traders, and returning students. Offered in even-numbered years.

134. Africa and U.S. Foreign Policy (4) II. Rothchild
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Overview of American foreign policy toward Africa. Relationship to global adversaries. Legacies of colonialism. Challenge of national self-determination and white racism. Policies on nonalignment, producer cartels, multinational corporations, continental integration, and trade and aid relations.

136. Soviet Foreign Policy (4) I, Zinner
Lecture—4 hours. Prerequisite: upper division standing or consent of instructor. Conduct of Soviet foreign relations in contemporary world affairs; ideology and power as mainsprings of policy; foreign policy as an instrument of revolution; the role of diplomacy, economic aid and nuclear armaments.

***137. International Relations in Western Europe** (4) III. The Staff
Lecture—4 hours. Prerequisite: upper division standing. Analysis of European unity, problems of the Atlantic alliance, Atlantic political economy, East-West relations, Communism in Western Europe and the relationship between domestic politics and foreign policy.

138. International Relations: East Asia (4) I, Kallgren
Lecture—4 hours. Prerequisite: upper division standing; course 3 recommended. Analysis of international relations and diplomacy in East Asia. Emphasis upon twentieth century problems with examples from China, Japan, Korea, and Southeast Asia.

139. Special Studies in Foreign Policy (4) I, II, III. The Staff
Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. Extensive examination of one or more special problems in foreign policy. May be repeated once for credit when different topic is studied.

140. Comparative Public Policy (4) I, Groth
Lecture—3 hours; term paper. Ideological orientations, institutions, processes, and public policies of modern states. Emphasis on democratic, socialist, communist and fascist experience.

***141. Communist Political Systems** (4) III. Zinner
Lecture—4 hours. 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.

***143. Latin American Politics** (4) II. The Staff
Lecture—4 hours. Survey of major issues in government and politics, with emphasis upon participation structure and decision-making processes. Four nations receive intensive study: Mexico, Cuba, Chile, and Brazil.

***145. Government and Politics in Emergent Nations** (4) III. Zinner
Lecture—4 hours. Prerequisite: course 2 or 2D. Conceptual study of problems of political organization and procedure in the context of rapid change engendered by social rev-

NOTE: For key to footnote symbols, see page 123.

olution in "emergent countries" and liberation from colonial oppression. Offered in even-numbered years.

***146. Contemporary African Politics** (4) I, Rothchild
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Analysis of party systems, military coups, bureaucracy, regional integration, and disintegration, and economic development in Africa south of the Sahara.

***147. Politics and Policy in Western Europe** (4) III. The Staff
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. Prerequisite: course 2 recommended. Evolution of political institutions and political culture in China with emphasis on the post 1949 period. Primary attention to nationalism, modernization and political efficacy.

148B. Government and Politics in East Asia: Pacific Rim (4) III. Kallgren
Lecture—4 hours. Prerequisite: course 2 recommended. Establishment and evolution of political cultures and establishment of political institutions in selected countries of the Pacific rim namely Japan, Korea, Taiwan. Emphasis on post World War II.

149. Politics of Development in East Africa (4) III. Rothchild
Lecture—3 hours; discussion—1 hour. Prerequisite: course 134 recommended. Analysis of the developmental process in the region of East Africa. Emphasis will be placed upon colonial impact, socio-economic environment, strategies of development, party systems, bureaucracy and military coups. Course is considered part of a year-long interdepartmental sequence of courses on East Africa, including Anthropology 139B and History 115B.

***150. Jurisprudence** (4) II. The Staff
Lecture—4 hours. An analysis of the nature and functions of law. Particular attention will be directed to law as an instrument of social control and the relationship between law and morality. Offered in even-numbered years.

151. Civil Rights and the Constitution (4) I, Dubois
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Constitutional rights and political possibilities of minority groups. Citizenship in the American federal system.

***152. The Politics of Justice** (4) II. Dubois
Lecture—3 hours; discussion—1 hour. Criminal and civil justice in America with emphasis upon such problems as legal representation for the poor, control of law enforcement processes, and problems in imprisonment and rehabilitation.

153. Due Process of Law and the Constitution (4) II. Dubois
Lecture—3 hours; discussion—1 hour. Study of the procedural and substantive meaning of the concept of "due process of law" under the U.S. Constitution. Major focus on the protections of the Bill of Rights and the Due Process Clause of the 14th Amendment in the area of criminal procedure.

156. Administrative Law (4) III. 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. The Staff
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. The Staff
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. The Staff
Lecture—4 hours. Prerequisite: course 5 or 5D or consent of instructor. Topics in the development of American legal thought and institutions: reception of the common law; church-state controversies; the role of judge and jury; federalism and individual rights; the natural law and economic regulation; law and the frontier. Offered in odd-numbered years.

159. Judicial Behavior (4) III. Dubois
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science 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) II. Owens
Lecture—3 hours; discussion—1 hour. Organization, operation, governmental function and social bases of political parties especially in Great Britain and France but with some reference to other Western European countries.

***162. Elections and Voting Behavior** (4) 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) I, Wade
Lecture—3 hours; discussion—1 hour. Groups, institutions, and individuals, especially in American politic. 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. Prerequisite: upper division standing and course 1 or 5, or consent of instructor. Nature of public opinion in America as it is "supposed to be" and as it is. Distribution of opinions among different publics and the significance of that distribution for system stability and institutions. Opinion polling and its problems.

165. Mass Media and Politics (4) III. Costantini
Lecture—3 hours; discussion—1 hour. Organization of and decision making within the media; media audiences and the effect of the media on attitudes and behavior; the relationship of the government to the media (censorship, secrecy, freedom of the press, government regulation); the media in election campaigns.

***166. Women in Politics** (4) III. The Staff
Lecture—3 hours; discussion—1 hour or seminar—1 hour. The role of women in American politics. Historical experiences; contemporary organizations and strategies; areas of legislative concern; the impact of differences in social class, race, and ethnicity upon the involvement of women in politics.

***167. Political Socialization** (4) II. Costantini
Lecture—3 hours; discussion—1 hour. Prerequisite: course 164 or consent of instructor. Who learns what about politics, and when and how they learn it. The process, content and sources of political learning, particularly in preadulthood, and the significance of such factors for the political system as well as for the development of the political self.

***168. Chicano Politics** (4) II. Riddell (Chicano Studies)
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. Political Elites (4) II. Costantini
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1, 2, or 4, or consent of instructor. Background, careers, motives and beliefs of political leaders. Place of elites in a democratic polity; elite-mass differences; conflict and consensus among elites.

***170. Politics and Personality** (4) III. Berman
Lecture—3 hours; discussion—1 hour. How is conduct of politics influenced by personal qualities of political actors? Course focuses on developing criteria for analyzing political phenomena in psychological terms by examining selected writings of twentieth-century theorists and psychobiographies.

171. The Politics of Energy (4) II. Wandesforde- Smith
Lecture—discussion—4 hours. Prerequisite: upper division standing. Analysis of nature and performance of political processes for making energy choices at the international, national and state levels. Emphasizes interaction of energy policy with other political goals and the ability of governmental institutions to overcome constraints on policy innovation.

***172. Agricultural Policy and Politics** (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Examination of the significance of agriculture in American politics. Analysis and interpretation of agricultural policy, including but not limited to price support-production control, environmental impact, farm labor, and relationship to foreign economic policy.

***173. Community Power and Change** (4) I. The Staff
Lecture—3 hours; discussion—1 hour. An examination of the relationship between general community characteristics, the distribution of political power and policy outputs in the United States. Alternative models of community political change are presented.

174. Government and the Economy (4) II. Musolf
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Political basis of economic policy (taxation, spending and regulation); impact of prices, employment and growth on political demands; elite responses to economic conditions; policy alternatives and the public interest.

175. Science, Technology, and Policy (4) II. Hill
Lecture—3 hours; discussion—1 hour. Analysis of policy-making for science and the use of scientific expertise for making decisions about technology. Topics include funding of basic research, relationship of science to technological development, science and military policy, technological risks, technology assessment and scientists and politics.

177. Modern Dictatorships (4) III. Groth
Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Selected political processes and institutions of dictatorships in Germany, Italy, Russia, Spain, Japan, and other states. Topics include executives, legislatures, parties, courts, bureaucracies, communications, and public opinion with comparisons to U.S. processes.

***178. Political Development in Modernizing Societies** (4) III. Gable
Lecture—3 hours; discussion—1 hour. Nature and sequence of political development; its economic and social concomitants; role of elites, military, bureaucracy, and Party systems; social stratification and group politics; social mobilization and political participation; instability, violence, and the politics of integration.

179. Special Studies in Comparative Politics (4) I, II, III. The Staff
Seminar—4 hours. Prerequisite: consent of instructor and upper division standing. Intensive examination of one or more special problems appropriate to comparative politics. May be repeated once for credit.

***180. Bureaucracy in Modern Society** (4) II. Gable
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Role of bureaucracy in a complex society, with emphasis upon changing relationships between government and the economy; consequences of rapid technological and social change for bureaucratic structures and processes; the problems of reconciling expertise and democracy and increasing the responsiveness of public bureaucracy.

***181. The American Administrative System** (4) I, Marshall
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Introduction to the development and organization of administrative institutions in the American federal system; focus on design and reorganization, and the relationship of structure to performance, at the national, subnational, and local levels.

***182. Administrative Decision Making and Public Policy** (4) III. Hill
Lecture—3 hours; special assignments. Approaches to models of administrative decision making; techniques of substantive policy analysis; problems and developments in planning, budgeting, personnel, and administrative reform.

183. Administrative Behavior (4) II. Gable
Lecture—3 hours; discussion—1 hour. The implications for American public administration of evolving concepts about behavior in organizations.

***185. Comparative Administration** (4) III. Gable
Lecture—4 hours. Methodologies, theories, and models of comparison; the setting of administrative systems; structures and functions of administrative systems in developed and developing politics, role of bureaucracy in development and nation-building.

***186. Urban Administration** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Role of the professional administrator in the urban political and social environment; application of modern management concepts to urban governmental organizations; and examination of persistent and emerging problems and issues.

***187. Administrative Theory** (4) II. Hill
Lecture—3 hours; discussion—1 hour. Historical and critical analysis of the principal theories of organization and management of public agencies in the light of such concepts as decision making, bureaucracy, authority and power, communication and control; an examination of the role of government bureaucracies in the total society.

188. Manpower Policy and Personnel Administration (4) III. Gable
Lecture—3 hours; discussion—1 hour. Politics and economics of effective manpower programs; planning manpower needs; recruitment, selection, and administration of public personnel; training and development; unions and collective bargaining; affirmative action; ethics and morality in the public service.

***189. Politics of Budgeting and Finance Administration** (4) II. Gable
Lecture—3 hours; discussion—1 hour. Fiscal role of gov-

NOTE: For key to footnote symbols, see page 123.

ernment in mixed economy and democratic society; politics of revenue and resource allocation; tax policy; inter-governmental financial relations; budget formulation and execution; alternative models of resource allocation; budget as a tool of management.

190. International Relations (4) II. Zinner
Lecture—2 hours; discussion—2 hours. Prerequisite: open to majors in International Relations, or consent of instructor. Analysis and evaluation of substantive issues in contemporary international relations. Readings drawn from current academic and non-academic periodicals.

***191. Special Studies in Local Government and Politics** (4) III. Sokolow, Marshall
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. Internship in Public Affairs (5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: enrollment dependent on availability of intern positions with highest priority assigned to students with Political Science—Public Service major; upper division standing. Supervised internship and study in political, governmental, or related organizations. (P/NP grading only.)

192B. Internship in Public Affairs (5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: course 192A; enrollment dependent on availability of intern positions with highest priority assigned to students with Political Science—Public Service major; upper division standing. Supervised internship and study in political, governmental, or related organizations. (P/NP grading only.)

193. Research in Practical Politics (2) I, II, III. The Staff
Research project—6 hours. Prerequisite: course 192A-192B; open only to Political Science—Public Service majors for whom it is required. Supervised preparation of an extensive paper relating internship experience to concepts, literature and theory of political science.

194HA-194HB-194HC. Special Study for Honors Students (2-3-5) I-II-III. The Staff (Jacobs in charge)
Directed research. Prerequisite: major in Political Science or Political Science—Public Service with junior standing and overall grade-point average of 3.5. Directed reading, research, and writing culminating in the preparation of a senior honors thesis under direction of faculty adviser. (Deferred grading only, pending completion of course sequence.)

195. Special Studies in American Politics (4) I, II, III. The Staff
Seminar—4 hours. Prerequisite: consent of instructor and upper divison standing. Intensive examination of one or more special problems appropriate to American politics. May be repeated once for credit when different subject matter studied.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

202. American State and Local Government (4) I, Sokolow
Seminar—4 hours. Prerequisite: course 102, 103, or 108, or consent of instructor. Analysis of American state and local government and politics. Special emphasis on community power structure, federalism, state legislatures, and state administration.

203. American National Government (4) II. Berman
Seminar—4 hours. Survey and analysis of the literature in the field of American Government. Emphasis upon development of methodologies for the study of American Government, and on the development of theories and concepts for understanding the behavior and performance of major national institutions.

***205. Field Research in Urban Politics and Policy** (4) II. Sokolow, Marshall
Seminar—2 hours; field research—2 hours. Examination of research design and methodologies appropriate to field research in community-level politics and policy, with an emphasis on elite interviewing and observation. Analysis of illustrative studies. Team participation in design, execution and analysis of a field research project.

207. Environment Public Policy (4) III. Wandesforde-Smith
Seminar—4 hours. Analysis of the interface between the world of academic reflection about ecological and environmental problems and the world of political action. Evaluation of alternative approaches to policy analysis and recommendation. Individual research, including field research, will parallel discussion of the literature.

208. Policy Analysis (4) II. Downs
Seminar—4 hours. Social science techniques applied to public policy formation and evaluation.

209. The American Political System (4) I, Wade
Seminar—4 hours. Analysis of selected theoretical and empirical issues posed by contemporary research in American government and politics.

213. Problems of Classical and Medieval Political Thought (4) III. Peterman
Seminar—3 hours. Prerequisite: consent of instructor. Concentrated study of the political thought of selected political thinkers of classical and medieval periods.

218. Political Theory (4) I, Zetterbaum
Seminar—3 hours.

223. International Relations (4) II. Domke
Seminar—3 hours.

***225. The International System** (4) III. Siverson
Seminar—3 hours. Analysis of the international system by means of theory formulation and integration; critique of research designs; use of various techniques of data generation and analysis.

***230. American Foreign Policy** (4) II.
Seminar—3 hours.

***241. Communist Political Systems** (4) II. Zinner
Seminar—4 hours. Prerequisite: course 141 or the equivalent, or consent of instructor. Systematic analysis of selected topics dealing with the political process of Communist political systems.

242. Seminar in Comparative Politics (4) II. 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. Policymaking in Third-World Societies (4) I, Rothchild
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Included in an analysis of policy making process in Third-World countries are such topics as political resources, institutional resources, decision-making, resource allocations, planning, and budgeting, implementation, and distribution of world resources. Offered in odd-numbered years.

***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) I, Owens
Seminar—3 hours. Survey of selected topics in American and comparative parties.

***261. Political Behavior** (4) III. Owens
Seminar—3 hours. Survey of selected topics in political behavior and public opinion.

282. Concepts and Problems in Public Administration (4) I, Gable
Seminar—4 hours. Nature of administrative processes in modern society; analysis of complex organizations; contemporary management practices and processes; and means of controlling bureaucracy. Offered in even-numbered years.

***283. Organizational Behavior** (4) II. Downs
Seminar—4 hours. Organizational behavior as it relates to public sector decision-making.

286. Administrative Values (4) III. Musolf
Seminar—3 hours. Examination of American administrative values. Offered in odd-numbered years.

290A. Research in American Government and Public Policy (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of American government and public policy.

290B. Research in Political Theory (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of political theory.

290C. Research in International Relations (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of international relations.

290D. Research in Public Law (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of public law.

290E. Research in Political Parties, Politics and Political Behavior (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of political parties, politics and political behavior.

290F. Research in Comparative Government and Policy (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of comparative government and policy.

290G. Research in Public Administration (4) I, II, III. The Staff
Seminar—4 hours. Special research seminar on selected problems and issues in the study of public administration.

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 Sudy (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Directed Reading (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

390. The Teaching of Political Science (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: graduate student standing in Political Science. Methods and problems of teaching political science at the undergraduate level. (S/U grading only.)

Pomology

(College of Agricultural and Environmental Sciences)

Don J. Durzan, Ph.D., Chairperson of the Department

Department Office, 1045 Wickson Hall (752-0122)

Faculty

James A. Beutel, M.S., Adjunct Lecturer
Royce S. Bringhurst, Ph.D., Professor
Dillon S. Brown, Ph.D., Professor Emeritus
Robert M. Carlson, Ph.D., Lecturer
Peter B. Catlin, Ph.D., Lecturer
Lawrence L. Claypool, Ph.D., Professor Emertitus
Julian C. Crane, Ph.D., Professor
Theodore M. DeJong, Ph.D., Lecturer
Don J. Durzan, Ph.D., Professor
William H. Griggs, Ph.D., Professor Emeritus
Paul E. Hansche, Ph.D., Professor *(Pomology, Genetics)*
Hudson T. Hartmann, Ph.D., Professor Emeritus
Claron O. Hesse, Ph.D., Professor Emeritus
Scott Johnson, Ph.D., Adjunct Lecturer
Adel A. Kader, Ph.D., Professor
Dale E. Kester, Ph.D., Professor
John M. Labavitch, Ph.D., Associate Professor
Omund Lilleland, Ph.D., Professor Emeritus
George C. Martin, Ph.D., Professor
Gale McGranahan, Ph.D., Adjunct Lecturer
Warren C. Micke, M.S., Adjunct Lecturer
F. Gordon Mitchell, M.S., Adjunct Lecturer
Dan E. Parfitt, Ph.D., Lecturer
Vito S. Polito, Ph.D., Assistant Professor
E. Louis Proebsting, Ph.D., Professor Emeritus
David E. Ramos, Ph.D., Adjunct Lecturer
Roger J. Romani, Ph.D., Professor
Kay Ryugo, Ph.D., Professor
Noel F. Sommer, Ph.D., Lecturer
Ellen G. Sutter, Ph.D., Assistant Professor
Kiyoto Uriu, Ph.D., Professor
Steven A. Weinbaum, Ph.D., Lecturer

Related Major Program. See the major in Plant Science, page 289.

NOTE: For key to footnote symbols, see page 123.

Related Courses. See Plant Science 109, 112, 112L.

Graduate Study. For graduate study related to the field of pomology, see the M.S. degree program in Horticulture on page 232.

Courses in Pomology

Lower Division Courses

10. Fruit and Nut Crop Production and Utilization (3) I, Kester in charge
Lecture—2 hours; discussion—1 hour; one all day Saturday field trip in lieu of part of discussion periods. Introduction to pomology including: climatic adaptation of deciduous fruits; orchard planning and management; tree nutrition and physiology; fruit development, maturation and harvesting; protecting from cold, quality, storage, transportation and marketing.

92. Internship in Pomology (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience on and/or off campus in the production and management of orchard crops or closely related enterprises. (P/NP grading only.)

Upper Division Courses

101. Tree Growth and Development (4) II. DeJong, Catlin
Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 102 or consent of instructor. Physiology of fruit plant growth and maintenance; species adaptation; responses to environment and cultural modification (pruning, soil and water management, etc.)

102. Principles of Fruit Production (4) III. Ryugo, Weinbaum
Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 2 or Plant Science 102. The course covers principles underlying cultural practices associated with fruit and nut production, including morphology and physiology of the developing buds, flowers and fruits. The course emphasis is on commercially important temperate zone species.

103. Citrus and Other Subtropical Fruits (3) II. Bringhurst and staff
Lecture—3 hours; field trip(s). Prerequisite: Botany 2. Subtropical fruits as important economic and nutritional resources; their origin, distribution, botanical nature, culture, production and utilization with particular emphasis on citrus but including avocados, dates, macadamias and various other species. Offered in even-numbered years.

107. Small Fruit Production (2) II. Bringhurst
Lecture—2 hours; two field trips arranged at mutual convenience. Prerequisite: Botany 2 or the equivalent. Strawberries (Fragaria), blackberries-raspberries (Rubus), blueberries-cranberries (Vaccinium), and currants-gooseberries (Ribes) as important nutritional resources; their origin, production and utilization with emphasis on recent progress in integrated management. Offered in even-numbered years.

170A-170B-170C. Applied Pomology (2-2-2) I-II-III. Kester, Micke, Ramos, and Uriu in charge
Lecture—seven 2-hour sessions; two full-day field trips. Prerequisite: introductory course in pomology or consent of instructor. Overview of production and handling of major pomological crops including a clinical study of important cultural and harvesting activities and problems associated with commercial fruit growing.

192. Internship in Pomology (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience on and off campus in the production and management of orchard crops or closely related enterprises. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Durzan in charge)
(P/NP grading only.)

Graduate Courses

201. Biochemistry of Maturation and Senescence (4) II. Romani
Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 111A-111B, Biochemistry 101A-101B-101L, and Plant Science 112; open to undergraduates. Biochemical and physiological phenomena associated with maturation and senescence of fruit and other plant parts. Emphasis on principles and mechanisms. Offered in even-numbered years.

203. Physiology of Fruit Plants (3) I, Weinbaum
Lecture—2 hours; discussion—1 hour. Prerequisite: Biochemistry 101A-101B; Botany 111A-111B or Plant Science 102; Pomology 101 and 102 or consent of instructor. Consideration of the physiological bases of developmental phenomena specific and/or characteristic of deciduous perennial fruit plants. Classroom discussions will include interpretation of current research as well as future research approaches. Offered in odd-numbered years.

205. Water and Nutritional Requirements of Deciduous Fruit Crops (4) III. Carlson, Uriu
Lecture—3 hours; laboratory—1 hour; field trips. Prerequisite: Soil Science 109, Botany 111A-111B or Plant Sci ence 102 (or the equivalent). Development and distribution of roots, irrigation and water relations, mineral nutrient status, deficiencies and excesses, symptoms, use of tissue analysis, chelates and deficiency corrections as factors in orchard management. Offered in odd-numbered years.

210. Fruit Morphology (4) III. Polito
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Botany 105 or 111A. Reproductive morphology of flowering plants with emphasis on tree-crop species. Topics include flower initiation and development, pollination and fertilization, fruit and seed development. Offered in even-numbered years.

212. Postharvest Biology and Biotechnology of Fruits and Nuts (3) III. Kader, Mitchell
Lecture—3 hours. Prerequisite: Plant Science 112 or the equivalent. Review of post-harvest biology of fruits and nuts in relation to biotechnological procedures used in handling, emphasizing research needs. Offered in odd-numbered years.

290. Seminar (1) I, II, III. The Staff (Catlin in charge)
Seminar—1 hour.

298.Group Study (1-5) I, II, III. The Staff (Durzan in charge)

299. Research (1-12) I, II, III, Summer. The Staff (Durzan 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 101.)

Preforestry Adviser. C. C. Delwiche *(Land, Air and Water Resources).*

Preventive Veterinary Medicine (A Graduate Group)

Margaret E. Meyer, Ph.D., Director of the Group

Group Office, 112 Surge-IV (752-2375/1376)

Graduate Study. The School of Veterinary Medicine offers a program of study and research leading to the Master's degree in Preventive Veterinary Medicine (M.P.V.M.). Detailed information on this program may be obtained by writing the Program Director in the Department of Epidemiology and Preventive Veterinary Medicine.

Graduate Adviser. M.E. Meyer (Epidemiology and Preventive Medicine).

Psychiatry

See Medicine

Psychology

(College of Letters and Science)

Albert A. Harrison, Ph.D., Chairperson of the Department

Department Office, 149 Young Hall (752-1880)

Faculty

Linda P. Acredolo, Ph.D., Associate Professor
Jarvis R. Bastian, Ph.D., Associate Professor
[3,4]Leo M. Chalupa, Ph.D., Professor
Richard G. Coss, Ph.D., Associate Professor
William F. Dukes, Ph.D., Professor Emeritus
Alan C. Elms, Ph.D., Professor
Albert A. Harrison, Ph.D., Professor
Kenneth R. Henry, Ph.D., Professor
[2]Joel T. Johnson, Ph.D., Assistant Professor
Neal E.A. Kroll, Ph.D., Professor
Joseph Lyons, Ph.D., Professor
William A. Mason, Ph.D., Professor
G. Mitchell, Ph.D., Professor
Robert M. Murphey, Ph.D., Professor
[1]Thomas Natsoulas, Ph.D., Professor
[3,4]Donald H. Owings, Ph.D., Professor
Karen E. Paige, Ph.D., Professor
Theodore E. Parks, Ph.D., Associate Professor
Robert B. Post, Ph.D., Assistant Professor
Stephanie A. Shields, Ph.D., Assistant Professor
Dean K. Simonton, Ph.D., Associate Professor
Robert Sommer, Ph.D., Professor
Charles T. Tart, Ph.D., Professor

The Major Programs

Psychology is both a science and a form of humanistic inquiry. It provides knowledge about human and animal behavior and constitutes a background for examining your own behavior and that of other people. The UCD Psychology program has several objectives: it presents an introduction to the study of individual and group behavior; it provides a liberal arts major for students looking for employment in business, government, personnel work, or other fields directly after obtaining their bachelor's degree; and it prepares students for graduate study in various areas of psychology, leading to teaching, research, and applied work. (Counseling and other careers in psychology require graduate-level training.)

The Psychology program at UC Davis is extremely broad and represents a wide variety of interests. The courses are organized around three focal points: *Personality/Social* emphasizes the individual in the social environment and includes such topics as personality theory, social psychology, abnormal psychology, individual differences, developmental psychology, humanistic psychology, and motivation. *Psychobiology* emphasizes the biological correlates of behavior and includes such topics as sensory psychology, physiological psychology, and comparative psychology. *Cognitive Psychology* emphasizes how information from the physical world is sensed, perceived and used, and stresses the

NOTE: For key to footnote symbols, see page 123.

roles of consciousness, language, and learning in making us what we are.

The Department offers both the Bachelor of Arts degree for the student interested in the liberal arts and the Bachelor of Science program geared for students with a keen interest in either biology or mathematics. Each program involves an introduction to each of the three areas of psychology. In addition to completing the required core courses, majors may also take specialty courses on topics such as sex differences, aging and maturity, environmental awareness, altered states of consciousness, and primate behavior.

Psychology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**17-21**
Psychology 1	4
Psychology 41, Statistics 13, or 102	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), minimum of 4 units	4-5
Recommended: both Statistics 13 and Psychology 41.	
Depth Subject Matter	**40**
Two courses from two of the following three groups and one course from the remaining group	21-23
Group A: Psychology 130, 131, 132, 135, 136	
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	17-19
Total Units for the Major	**57-61**

Psychology

B.S. Major Requirements:

Biology Emphasis

	UNITS
Preparatory Subject Matter	**47-50**
Psychology 1	4
Statistics 13 or 102	4
Mathematics 16A-16B or 21A-21B	6-8
Physics 10	4
Biological Sciences 1, Physiology 2, Zoology 2, 2L	15
Chemistry 1A, 1B	10
One course in sociology or cultural anthropology (may be lower or upper division), minimum of 4 units	4-5
Depth Subject Matter	**47-50**
Seven Psychology courses distributed as specified: Group A two courses from 130, 131, 132, 135, 136	8-9
Group B: three courses from 108, 129, 134, 150	15
Group C: two courses from 112, 145, 147, 168	8
Additional units to achieve a total of 40 upperdivision units in psychology	8-9
Genetics 100A-100B or 120	4-6
Zoology 125 or 148	3-4
Total Units for the Major (Biology Emphasis)	**94-100**

Recommended
Psychology 41, 154, 180B, and 199 (on a psychobiological topic); Zoology 105, 106; Anthropology 154, Environmental Studies 110.

Mathematics Emphasis

	UNITS
Preparatory Subject Matter	**40-44**
Psychology 1	4
Statistics 13 or 102	4
Mathematics 21A, 21B, 21C	12
Computer Science Engineering 8 or the equivalent	3
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), minimum of 4 units	4-5
Recommended: Psychology 41.	
Depth Subject Matter	**46-49**
Five Psychology courses, distributed as specified:	
Group A: two courses from 130, 131, 132, 135	8-9
Group B: two courses from 108, 129, 134, 150	10
Group C: one course from 112, 145, 147, 168	4
Psychology 103	5
One course from Psychology 105, 206, 207	4
Additional units to achieve a total of 40 upper division units in psychology	8-9
One course sequence from Statistics 106-108, 130A-130B, 131A-131B	7-8
Total Units for the Major (Mathematics Emphasis)	86–93

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. It is strongly recommended that Psychology 41 or Statistics 13 be taken prior to enrolling in upper division courses.

Major Advisers. L. P. Acredolo, J. R. Bastian, L. M. Chalupa, R. G. Coss, A. C. Elms, A. A. Harrison, K. R. Henry, J. T. Johnson, N. E. A. Kroll, J. Lyons, W. A. Mason, G. Mitchell, R. M. Murphey, T. Natsoulas, D. H. Owings, K. E. Paige, T. E. Parks, R.B. Post, S. A. Shields, D. K. Simonton, R. Sommer, C. T. Tart.

Honors and Honors Program. In order to be eligible for highest honors in Psychology, the student must both meet the college criteria and complete an empirical research project (i.e., experiment or field study) which is written in thesis form and approved by the Department. See pages 63 and 92.

Minor Program Requirements:

	UNITS
Psychology	**24**
One course from each of the following three groups	13-14
Group A: Psychology 130, 131, 132, 135, 136	
Group B: Psychology 108, 129, 134, 150	
Group C: Psychology 112, 145, 147, 168	
Additional units to achieve a total of 24 upper division units	10-11

Graduate Study. The Department offers programs of study and research leading to the Ph.D. degree in psychology. Detailed information regarding graduate study may be obtained by writing the Graduate Adviser, Department of Psychology.

Graduate Adviser. See Class Schedule and Room Directory.

Courses in Psychology

Lower Division Courses

1. General Psychology (4) I, II, III. The Staff
Lecture—4 hours. A general introduction emphasizing empirical approaches with particular focus on the areas of perception and cognition, personality and social psychology, and biological aspects of behavior. Not a prerequisite for Psychology 15 or 16.

15. Introductory Psychobiology (4) I, II, III. The Staff
Lecture—4 hours. A survey of genetic, evolutionary and physiological factors affecting behavior. Using the comparative approach where appropriate, the relevance of biological and biosocial mechanisms to an understanding of people and their interaction with their environment will be emphasized.

16. Psychology and Modern Life (3) I, II, III. The Staff
Lecture—3 hours. Personality development, interpersonal relationships, and the relevance of psychology to social processes.

41. Research Methods in Psychology (4) I, II, III. Mitchell
Lecture—4 hours. Introduction to experimental design, interviews, questionnaires, field and observational methods, reliability and statistical inference.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
By prior arrangement with individual instructor. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)
By prior arrangement with individual instructor. (P/NP grading only.)

Upper Division Courses

103. Advanced Quantitative Description of Behavior (5) I, Kroll, Johnson
Lecture—5 hours. Prerequisite: Statistics 13 or 102 or course 41 or consent of instructor. Summary, inference, and prediction from psychological data, with emphasis on the theoretical aspects.

105. Statistical Inference from Psychological Experiments (4) II. Kroll
Lecture—4 hours. Prerequisite: course 103 or consent of instructor. Probability theory, sampling distributions, hypothesis testing, statistical inference, and nonparametric statistics.

108. Physiological Psychology (5) I, II, III. Chalupa, Henry
Lecture—4 hours; laboratory—2 hours. Prerequisite: course 1; at least one zoology or physiology course recommended. Relationship of brain structure and function to emotion, motivation, perception, states of consciousness, language, learning, and memory in humans and other animals; introduction to methods of physiological psychology.

112. Developmental Psychology (4) I, II, III. Mitchell, Shields, 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) I, Bastian, Murphey
Lecture—3 hours; term paper. Prerequisite: course 1; upper division standing or consent of instructor. Development of psychological thought and research in context of history of philosophy and science.

129. Sensory Processes (5) I, II, III. Henry
Lecture—4 hours; discussion, project, or term paper—1 hour. Prerequisite: course 1 or Zoology 2-2L or consent of instructor. Psychobiology of sensory systems in man and other animals. Relationship of behavior to physiology, structure and function of the senses.

130. Human Learning and Memory (4) I, II, III. Kroll, Parks
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and either Statistics 13 or 102 or course 41; or consent of instructor. Consideration of major theories of human learning and memory with critical examination of relevant experimental data.

131. Perception (4) I, II, III. Natsoulas, Bastian, Parks, Post
Lecture—3 hours; independent library work. Prerequisite: course 1. The cognitive organizations related to measurable physical energy changes mediated through sensory channels. The perception of objects, space, motion, events.

132. Language and Cognition (5) II. Bastian
Lecture—5 hours. Prerequisite: course 1, and 6 units of upper division work in psychology or linguistics. Zoological, cultural, and individual perspectives of linguistic actions; their production, perception, cognitive significance, and their roles in human conduct, enculturation, and cognitive development.

134. Animal Learning and Motivation (5) I, Coss
Lecture—5 hours. Prerequisite: course 1 or 15 or consent of instructor. General theories of phyletic differences in learning and motivation drawing upon data from laboratory and field observations. Innate physiological mechanisms, developmental changes, effects of conditioning and other constraints on these processes are examined.

***135. Psychology of Consciousness** (4) II, III. Natsoulas
Lecture—4 hours. Prerequisite: course 1. Consideration of major theories of consciousness, with critical examination of relevant experimental, clinical, and field data.

136. Cognitive Psychology (4) I, III. Kroll
The Staff Lecture—3 hours; term paper. Prerequisite: course 1. Introduction to human information processing, mental representation and transformaton, imagery, attention, concept formation, problem solving, and computer simulation.

NOTE: For key to footnote symbols, see page 123.

137. Altered States of Consciousness (4) I, III. Tart
Lecture—4 hours. Prerequisite: course 1. Characteristics, uses, and abuses of altered states of consciousness from experiential, behavioral, physiological, and methodological perspectives. Topics typically include sleep, borderline states, dreams, meditation, hypnosis, autohypnosis, marijuana intoxication, psychedelic drugs and mystical experiences.

143. Human Emotion and Feeling (4) I, Natsoulas, Shields
Lecture—4 hours. Prerequisite: introductory psychology course. An introduction to current theories and research on emotion and bodily feelings with special reference to self-knowledge.

144. Environmental Awareness (4) I, II, III. Sommer, Coss
Lecture—4 hours. Prerequisite: course 1. Interactions of people with built environments. Research methods for evaluating designed environments and reviews of current research in environmental psychology.

145. Social Psychology (4) I, II, III. Simonton, Johnson
Lecture—4 hours. Prerequisite: course 1. Behavior of the individual in the group. Examination of basic psychological processes in social situations, surveying various problems of social interaction: group tensions, norm-development, attitudes, values, public opinion, status.

147. Personality Theory (4) I, II, III. Elms, Paige
Lecture—4 hours. Prerequisite: course 1. The theories of Freud, Erikson, and other major twentieth-century approaches to personality.

***148. Interpersonal Relations** (4) II.
Lecture—4 hours. Prerequisite: 16 hours of social science or the equivalent and consent of instructor. Study of interpersonal relationships from both a theoretical-experimental and experiential viewpoint. Social psychological theory, case studies and a small group laboratory within the class provide the basis for class discussion. Limited enrollment.

149. Psychology of Sex Differences (4) I, II. Paige, Mitchell
Lecture—4 hours. Prerequisite: upper division standing and enrollment in one of the following: course 108, 145 or 147. Extensive review of theory and research related to the origin of sex differences in human behavior. The role of physiology, child socialization, and cultural institutions in determining sex differences in personality, cognitive abilities, motivations, and social status.

150. Comparative Psychology (5) I, II, III. Mason, Owings, Mitchell
Lecture—4 hours; discussion or project—1 hour. Prerequisite: courses 1 or 15 or consent of instructor. Perspectives in animal behavior; psychological, ethological, and social systems, with an emphasis on functional behavioral categories from the standpoint of adaptation and evolution.

154. Primate Psychology (4) I. Mitchell
Lecture—4 hours. Prerequisite: course 15 or 150 or an equivalent course in biological sciences; consent of instructor. Comparative survey of primate psychology, based primarily on laboratory experimentation in learning, communication, cognition, sensation, motivation, emotion, perception, and effects of early experience in many species of primates.

157. Personality Assessment (4) II.
Lecture—4 hours. Prerequisite: course 41 or Statistics 13. An exploration of the principal methods in psychological assessment of personality, aptitude, and ability, including objective, questionnaire, and projective tests.

159. Social Psychology of Black Americans (5) II.
Lecture—4 hours; discussion—1 hour. Prerequisite: course 145 and Sociology 130, or consent of instructor. Interactions within the black community and between the black community and national institutions from the perspectives of black personality, black culture, and national institutional structure.

165. Introduction to Clinical Psychology (4) I, II, III. Lyons
Lecture—4 hours. Prerequisite: courses 1, 168, and either 112 or 145. Major theoretical formulations in the history of clinical psychology, from classical psychoanalysis to contemporary existentialism and behavior modification. Survey based on lectures, films, and tapes, of what clinical psychologists do, including methods of appraisal, professional roles, and approaches to treatment.

168. Abnormal Psychology (4) I, II, III. Murphey, Sommer
Lecture—4 hours. Prerequisite: course 1. Descriptive and functional account of behavioral disorders, with primary consideration given to neurotic and psychotic behavior.

171. Humanistic and Transpersonal Psychology (4) II. Tart
Lecture—4 hours. Prerequisite: course 165 or the equivalent and consent of instructor. Survey, including lectures and demonstrations, of humanistic, and transpersonal movements in contemporary psychology. Theory, data, and techniques in the work of Maslow and others who emphasize creativity, self-actualization, and realization of human potential.

177. Psychobiography and Life History (4) III. Elms
Lecture—4 hours. Prerequisite: course 1 or 16 or consent of instructor. Case-history research as a nonquantitative approach to studying personality. Psychological interpretation of life histories of outstanding individuals in the arts, politics, science and other areas.

180A. Research in General Experimental Psychology (4) II, III. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: four upper division Psychology courses and consent of instructor. Empirical research on selected topics in general experimental psychology (general research design and analysis, perception, cognition, cognitive development, etc.). Specific content will vary from quarter to quarter. May be repeated once for credit when the content differs.

180B. Research in Psychobiology (4) I, II, III. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: four upper division Psychology courses and consent of instructor. Empirical research on selected topics in psychobiology (animal learning and motivation, comparative psychology, physiological psychology, sensory psychology, etc.). Content will vary from quarter to quarter. May be repeated once for credit when the specific content differs.

180C. Research in Personality and Social Psychology (4) I, III. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: four upper division Psychology courses and consent of instructor. Empirical research on selected topics in personality and social psychology (personality, social psychology, organizational psychology, etc.). Content will vary from quarter to quarter. May be repeated once for credit when the specific content differs.

183. Organizational Psychology (4) III. Harrison
Lecture—4 hours. Prerequisite: introductory psychology course. Survey of interrelationships among psychological processes, interpersonal dynamics, and organizational forms. Topics include motivation, communication, decision making, leadership, personnel selection and training, stress and conflict, career development, organizational development, and organization-community relations.

190. Seminar in Psychology (4) I, 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.

192. Field Work in Psychology (1-6) I, II, III. Harrison
Field work—3-18 hours; term paper. Prerequisite: upper division standing in psychology and consent of instructor. Supervising internship, off- and on-campus, in community and institutional settings. Credit not applicable toward 40 units of upper division Psychology required of majors. May be repeated once for credit. Limited enrollment. (P/NP grading only.)

197T. Tutoring in Psychology (1-3) I, II, III. The Staff
Prerequisite: upper division standing and consent of instructor. Tutoring in Psychology Department courses. This course is intended for advanced undergraduate students who will lead discussion sections in Psychology courses. May be repeated for credit for a total of 8 units. No more than 6 units may count toward the Psychology major requirement. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Directed small group study on psychological topics of special interest and relevance to instructor and students. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
By prior arrangement with individual instructor. (P/NP grading only.)

Graduate Courses

200. Current Research Topics in Psychology (1) I. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. A seminar designed to introduce students entering graduate work in the department to its ongoing research activities. (S/U grading only.)

201. Research Preceptorship (4) I, II, III. The Staff
Laboratory-discussion—6-9 hours. Prerequisite: consent of instructor. (S/U grading only.)

205. Advanced Statistical Inference from Psychological Experiments (5) II. Kroll
Lecture—5 hours; project and term paper. Prerequisite: graduate student standing and consent of instructor. Probability theory, sampling distributions, nonparametric statistics, statistical inference, and hypothesis testing. A term paper will be required which develops a research proposal with a detailed discussion of the statistical techniques to be employed.

206. Statistical Analysis of Psychological Experiments (4) III.
Lecture—4 hours. Prerequisite: course 103 or consent of instructor. Statistical analysis of data obtained with various experimental designs; analysis of variance and covariance, factorial and repeated measures, Latin square designs, and tests of trends.

207. Multivariate Analysis of Psychological Data (4) III. Simonton
Lecture—4 hours. Prerequisite: course 105 or 205 or consent of instructor. The application of multiple regression, factor analysis and related correlational techniques to non-experimental, quasi-experimental, and experimental data. Techniques implemented using computer multivariate statistical packages.

***208. Physiological Psychology** (4) III.
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) II. Acredolo, Shields
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The original behavioral repertoire of the child and its subsequent development.

***220. Topics in the History of Psychology** (4) II. The Staff
Lecture—2 hours; seminar—2 hours. Prerequisite: graduate standing in Psychology or consent of instructor. A lecture-seminar on selected topics in the history of psychology, and on the applicability of early psychological theory and research to contemporary investigations.

***229. Sensory Processes** (4) I, Chalupa, Henry, Owings
Lecture—2 hours; seminar—2 hours. Prerequisite: graduate standing in Psychology and consent of instructor. A lecture-seminar on selected topics in the fields of sensory psychology and physiology with an emphasis on the biological correlates of sensory processes.

***230. Learning** (4) II. Parks, Kroll
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theories of learning and memory as applied to the experimental study of simple and complex behavioral processes.

231. Perception (4) II. Natsoulas, Post
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Analysis of the role of perception in experience and its effects on behavior.

245. Social Psychology (4) III. Johnson
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in social psychology.

247. Personality (4) I. Paige
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in human personality.

250. Comparative Psychology (4) I. Mason
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. The study of animal behavior in an evolutionary and comparative framework.

***251. Genetic Correlates of Behavior** (4) II. Murphey
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and experiment in the genetic determination of animal and human behavior.

252. Seminar in Psychobiology (4) I. Chalupa, Owings
Seminar—4 hours.

263A-263B-263C. Topics in Cognitive Psychology (4) I, II, III. 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.

***265. Psychology of Consciousness** (4) I. Natsoulas
Seminar—4 hours. Prerequisite: graduate standing in Psychology or consent of instructor. Theory and research in the psychology of consciousness.

***272. Experimental Study of Personality** (4) II.
Seminar—4 hours.

***273. Environment and Behavior** (4) III. Sommer
Seminar—4 hours. The social psychology of the environment. Research into the use of space and its design implications.

***275. Attitude Formation and Change** (4) II. 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. The Staff
Seminar—4 hours. Prerequisite: consent of instructor. Seminar devoted to a highly specific research topic in any area.

NOTE: For key to footnote symbols, see page 123.

of basic psychology. Special topic selected for a quarter will vary depending on interests of instructor and students.

298. Group Study (1-5) I, II, III. The Staff
(S/U grading only.)

299. Research (2-9) I, II, III. The Staff
(S/U grading only.)

299D. Dissertation Research (1-9) 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. Murphey
Seminar—4-2-4. Prerequisite: graduate standing in psychology and consent of instructor. Practical experience in teaching. Methods and problems of teaching psychology at the undergraduate and graduate levels; curriculum design and evaluation. Practical experience in the preparation and presentation of material. (Deferred grading only, pending completion of sequence.)

Radiological Sciences

(School of Veterinary Medicine)

Timothy R. O'Brien, D.V.M., Ph.D., Chairperson of the Department

Department Office, 1114 Medical Science-1A (752-0184)

Faculty

Steven A. Book, Ph.D., Associate Adjunct Professor *(Laboratory for Energy-Related Health Research)*
Marvin Goldman, Ph.D., Professor *(Laboratory for Energy-Related Health Research)*
Juan A. Gomez, D.V.M., Ph.D., Associate Professor
William J. Hornof, D.V.M., M.S., Assistant Professor
[4]Joe P. Morgan, D.V.M., Vet. med. dr., Professor
Thomas G. Nyland, D.V.M., Assistant Professor
[2 3]Timothy R. O'Brien, D.V.M., Ph.D., Professor
Otto G. Raabe, Ph.D., Adjunct Professor *(Laboratory for Energy-Related Health Research)*
Jane M. Turrel, M.S., D.V.M., Assistant Professor

Part-Time Clinical Faculty

Sam Silverman, D.V.M., Associate Clinical Professor

Courses in Radiological Sciences

Upper Division Courses

115. Bioenvironmental Consequences of Nuclear Technology (3) III. Goldman
Lecture—2 hours; discussion—1 hour; field trip to Nuclear Power Station. Prerequisite: Physics 2A and Biological Sciences 1 or the equivalent; consent of instructor. Discussion of biospheric implications of radionuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on the predications of the response of the most sensitive physiological systems will be emphasized. (Same course as Environmental Studies 115.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. Radiology Staff
(P/NP grading only.)

Graduate Courses

269A-269B. Fundamentals of Radiation Biology (2-2) I-II. Goldman
Lecture—2 hours. Prerequisite: introductory courses in physics, biochemistry and physiology or consent of instructor. Biological effects of radiation including genetic, teratogenic, carcinogenic responses in terms of dose quality and quantity. Included are discussions of dose-effect relationship, radiation therapy, environmental radioactivity, and radiation-protection criteria. Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. Radiology Staff
(S/U grading only.)

299. Research (1-12) I, II, III. Radiology Staff
(S/U grading only.)

Professional Courses

408. Special Procedure Rounds (2) I, II, III. The Staff
Discussion—6 hours. Prerequisite: a DVM degree and consent of instructor.† Review of selected radiology cases from previous day. Specific radiographic changes and differential diagnosis are discussed, with participants leading the discussions. Special procedures such as angiography; nuclear medicine and ultrasound examinations are reviewed. May be repeated for credit. (S/U grading only.)

409. Known Case Conference (1.5) I, II, III. The Staff
Discussion-demonstration—1.5 hours. Prerequisite: a DVM degree and consent of the instructor.† Film review of current VM Teaching Hospital proven cases. Intended for Radiology residents and others with background in diagnostic radiology. May be repeated for credit. (S/U grading only.)

410. Radiology of the Skeletal System: Large Animals (3) III. O'Brien and Staff
Lecture—3 hours. Prerequisite: a DVM degree and consent of instructor.† Radiographic diagnosis of pathologic conditions of the skeleton. These conditions include fractures, skeletal disorders of the foal, bone and joint disease, osteochondrosis, respiratory problems, and spinal disorders. Offered every three years (next offering, Spring 1985).

411. Radiology of the Appendicular Skeleton (3) II. Morgan and staff
Lecture—1.5 hours; discussion—1.5 hours. Prerequisite: a DVM degree and consent of instructor.† Presentation of information on radiographic diagnosis of pathologic conditions of the bones and joints in appendicular skeleton. Congenital, developmental, traumatic, inflammatory, neoplastic, and degenerative lesions. Offered every three years (next offering, Winter 1985).

412. Urogenital Radiography (3) I, Nyland and staff
Lecture—3 hours. Prerequisite: a DVM degree and consent of instructor.† Radiographic diagnosis of small animal urogenital tract disorders. Included are diseases of the kidneys, ureters, bladder, urethra, uterus, and prostate. Theory and interpretation of contrast, untrasound, and nuclear medicine procedures. New procedures and current research topics. Offered every three years (next offering, Fall 1984).

413. Gastrointestinal Radiography (3) I, O'Brien and staff
Lecture—3 hours. Prerequisite: a DVM degree and consent of instructor.† Presentation of information on radiographic diagnosis of pathologic conditions of the abdomen. Included are diseases of the liver, stomach and intestines. Theory and interpretation of upper and lower GI procedures, cholecystography and other special procedures. Offered every three years (next offering, Fall 1985).

414. Pulmonary Radiography (3) II. Gomez and staff
Lecture—3 hours. Prerequisite: a DVM degree and consent of instructor.† Radiographic diagnosis of thoracic disorders of the dog and cat, excluding cardiac diseases. Techniques, indications, complications, and value of special radiographic procedures and topics of special interest will be discussed. New diagnostic modalities will be reviewed together with current research, literature and new procedures. Offered every three years (next offering, Winter 1986).

415. Nuclear Medicine (2) III. Hornof and staff
Lecture—2 hours. Prerequisite: a D.V.M. degree, Radiology-Nuclear Medicine 400A, and consent of instructor.† Application of nuclear medicine techniques including computer usage to the diagnosis of various disease states in animals. Radiologic diagnosis of various disease states in animals as well as the methodology for performing special procedures in animals will be cov ered. Offered every three years (next offering, Spring 1986).

416. Principles of Radiotherapy (2) I, Turrel and staff
Lecture—2 hours. Prerequisite: a DVM degree and consent of instructor.† Introductory course in principles of radiotherapy, physics of equipment, and dosimetry. Emphasis will be placed on radiation safety regulations and monitoring devices. Applications of radiotherapy and patient selection. Techniques of teletherapy and brachytherapy. Offered every three years (next offering, Fall 1986).

417. Cardiovascular Radiography (3) II Gomez and staff
Lecture—3 hours. Prerequisite: a DVM degree and consent of instructor.† Radiographic diagnosis of cardiovascular disorders of the dog and cat. Emphasis will be placed on angiocardiography and angiography of the head, abdomen, and extremities. Newer diagnostic techniques including nuclear medicine, ultrasound and CT scanning will be reviewed and current research and literature. Offered every three years (next offering, Winter 1987).

418. Radiology of the Axial Skeleton (3) III. Morgan and staff
Lecture—1.5 hours; discussion—1.5 hours. Prerequisite: a DVM degree and consent of instructor. Radiographic diagnosis of pathologic conditions of the axial skeleton including congenital, developmental, traumatic, infectious, and neoplastic diseases. Theory and interpretation of myelography. Radiography of the skull and mandible. Offered every three years (next offering, Spring 1987).

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 123.

Radiology

See Medicine

Range and Wildlands Science

See below, and the Graduate Group (page 299); and also Range Science

Range and Wildlands Science

(College of Agricultural and Environmental Sciences)

The Major Program

Range and Wildlands Science is the study of the biological and physical components of land resources which are used mostly for grazing domestic livestock, but which also provide wildlife habitats, watersheds, recreation, and open space.

The major provides background in the biological, physical, and social sciences. Comprehensive study in the plant, animal, soil, and resource sciences supplements the core of range management courses. Integration of the knowledge of a variety of specialized fields is learned as a basis for land management oriented toward the multiple use concept and the maintenance of environmental quality.

The field is broad and diverse. Graduates, especially those with some experience, may be employed as consultants, ranch managers, or ranchers. They may also qualify for the position of Range Conservationist in governmental agencies such as the Forest Service, Soil Conservation Service, and the Bureau of Land Management. If career work with such an agency is desired, it is recommended that trainee or apprenticeship experience with that agency be included in the major program. In addition, the training provided by this major should give an excellent background for natural resource management positions.

Job experience, in-service training, and formal education beyond the bachelor's degree may lead to advanced professional positions in research, education, or management.

Range and Wildlands Science

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. Courses shown without parentheses are required.)

	UNITS
Preparatory Subject Matter	**54-65**
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16

Physics (Physics 1A, 1B) 6
Mathematics (Agricultural Science and Management 150; either Mathematics 15-16A or 16A-16B recommended) 4-10
Computer science (Mathematics 19, or Engineering 5) 3
Economics (Agricultural Economics 1, Economics 1A, or 1B) 4-5
Geology (Geology 1-1L; Geology 2, 2L recommended) 4-8
Soil science (Soil Science 100) 4
Animal science (Animal Science 2) 3

Depth Subject Matter 50-63
Plant physiology (Botany 111A-111B) 6
Plant ecology (Plant Science 101 or Botany 117) ... 4
Meteorology (Geography 3, Atmospheric Science 20, or 105) 3
Soil science, two upper division courses 6-8
Watershed management (Water Science 141) 3
Animal nutrition (Nutrition 103) 4
Wildlife ecology or management, one upper division course in wildlife and fisheries biology, or zoology 3-4
Forage crops (Agronomy 112, 112L) 3-4
Range science (Range Science 1, 92, 100, 105, 133, 134, 135, 142, 145, 150, 160, 164, 170, 192, 198, 199) 18-27

Breadth Subject Matter 32-36
English, or English and rhetoric (see College requirement, page 71) 8
Social sciences and humanities electives† 12
Two upper division social science courses in one or two of the following: agricultural economics, economics, environmental studies, geography, or political science 6-8
Two upper division natural science or applied biological science courses in one or two of the following: animal science, botany, entomology, genetics, geography, mathematics, nematology, plant pathology, plant science, resource sciences, water science, or weed science 6-8

Unrestricted Electives 16-44

Total Units for the Major 180

Major Adviser. C.A. Raguse (Agronomy and Range Science).

Graduate Study. See page 94.

Range and Wildlands Science (A Graduate Group)

R. Merton Love, Ph.D., Chairperson of the Group

Group Office, 131 Hunt Hall (752-1713)

Graduate Study. The Graduate Group in Range and Wildlands Science offers a program of study and research leading to the M.S. degree. For detailed information regarding the program, address the graduate adviser for the group.

Graduate Adviser. W. A. Williams *(Agronomy and Range Science).*

Range Science

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Agronomy and Range Science.

Major Program. See the major, Range and Wildlands Science, above.

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 Graduate Announcement.

Graduate Adviser. W. A. Williams *(Agronomy and Range Science).*

Related Courses. See Agronomy 112, 112L, Nutrition 103, Resource Sciences 100, Soil Science 105, 120, 121, Wildlife and Fisheries Biology 151.

Courses in Range Science

Questions pertaining to the following courses should be directed to the instructor or to the Advising Center, 258 Hunt Hall.

Lower Division Courses

1. Principles of Range Management (4) I, Phillips
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.

92. Range Science Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience off or on campus in all subject areas pertaining to range management. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

***100. Range Plants** (4) I, Crampton
Lecture—2 hours; laboratory—6 hours; two Saturday field trips. Prerequisite: Botany 2. Systematic relationships and identification of range grasses; legumes, forbs, and shrubs; their distribution, environmental requirements, and use.

105. Field Course (2) III. Menke, Crampton
Lecture—10 hours total; laboratory—30 hours total. Prerequisite: consent of instructors. Field studies of range conditions and methods of utilization in various parts of the state. To be given between winter and spring quarters. Considered a spring course for preenrollment.

133. Grassland Ecology (3) II. Raguse
Lecture—3 hours; one Saturday field trip. Prerequisite: course in plant ecology or consent of instructor. Structure, function and environment of North American grasslands, with emphasis on the California annual type. Concepts and problems in measuring primary and secondary productivity. Principles of grassland and management including vegetation improvement, utilization by animals, and recreation and aesthetic values. Offered in even-numbered years.

134. Comparative Ecology of Major Rangeland Systems (4) II. Menke
Lecture—3 hours; one weekend field trip to Nevada; term paper. Prerequisite: course 100 or the equivalent; or consent of instructor. Study of vegetation structure, composition, and succession in representative North American rangeland plant communities. Description and comparison of interactions between vegetation and grazing animals on grassland, desert, forested, and tundra rangelands. Discussion of management strategies used in these systems today. Offered in odd-numbered years.

***135. Ecology and Community Structure of Grassland and Savanna Herbivores** (3) II. Demment
Lecture—3 hours. Prerequisite: Biological Sciences 1 or Botany 2 or Zoology 2 or the equivalent; general ecology course recommended. Feeding ecology of grassland herbivores and its importance in evolution of herbivore communities and social systems. Optimal foraging, interspecific interactions, and primary productivity are considered as factors structuring natural and managed grassland and savanna systems.

142. Rangeland Improvements (3) II. Jones, George
Lecture—3 hours. Prerequisite: courses 1 and 100. Improvement and development practices and their environmental impacts on rangeland communities, including vegetation-type conversion, range animal and grazing management, fertilization, reseeding, water development and management, control of undesirable plants by mechanical, herbicidal and biological methods, and pest-predator control.

145. Revegetation of Disturbed Lands (2) II. Kay
Lecture—2 hours. Prerequisite: Botany 2 and Soil Science 100. Principles of revegetation and specific applications. Topics include characteristics of disturbed sites, especially soil-related problems; techniques for mechanical stabilization, mulching, and seeding; and plant materials used. Integrates principles and techniques by use of specific case histories. Offered in odd-numbered years.

150. Principles of Rangeland Vegetation Measurement, Inventory and Evaluation (4) III. Menke
Lecture—2 hours; laboratory—3 hours; one weekend field trip. Prerequisite: course 100, Agricultural Science and Management 150; intended for senior and graduate students. Principles and techniques of sampling grassland and shrubland vegetation cover, frequency, density, and weight. Methods and procedures for inventorying rangeland vegetation resources. Data analysis and evaluation using concepts of range site potential, range condition, range trend, and proper utilization. Offered in odd-numbered years.

***160. Range Livestock Production** (4) III. Morris, Raguse
Lecture—3 hours; discussion—1 hour. Prerequisite: course 100, 133, or 134; Nutrition 103, 110, or 122; upper division standing. Application of principles of animal and range science to the extensive production of livestock and related products from range. Emphasis on beef and sheep production systems from perennial and annual range types. (Same course as Animal Science 160.)

***164. Multiple Use of Rangelands** (3) II. The Staff
Lecture—3 hours; two optional Saturday field trips. Prerequisite: course 1 or 100 and upper division standing. Multiple use of rangelands with emphasis on North America.

170. Range Ecosystem Planning (4) III. Menke
Lecture—3 hours; laboratory—3 hours; one (weekend) 3-day field trip. Prerequisite: Animal Science 160/Range Science 160 (may be taken concurrently); Mathematics 19 or Engineering 5 recommended. Planning of rangeland management at local and regional levels, including current planning efforts of governmental agencies. Site-specific rangeland planning based on land capabilities, estimated forage production, and "multiple use" requirements. Plans will be developed for a particular range ecosystem using linear programming techniques. Offered in even-numbered years.

192. Range Science Internship (1-12) I, II, III, summer. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off or on campus in all subject areas pertaining to range management. Internships supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Raguse in charge)
Prerequisite: senior standing and consent of instructor. (P/NP grading only.)

Graduate Courses

208. Computer Modeling in Range and Crop Management (3) I, Williams
Lecture—2 hours; discussion—1 hour. Prerequisite: Agronomy 205B, Animal Science 128, or Environmental Studies 121. Development of computer models involving dynamic simulation and optimization modes for range and crop management problems. Modeling philosophy, assumptions, implementation, validation, and experimentation emphasized. Offered in odd-numbered years.

290. Seminar in Range Management (1-2) II, Williams; III, Phillips
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 (Williams in charge)
Selected topics from current world literature in range science.

299. Research (1-12) I, II, III. The Staff (Williams in charge)
Original research involving plant physiology, plant genetics, plant biochemistry, agricultural chemistry, or soil-plant relationships of range and wildlands. (S/U grading only.)

Religious Studies

(College of Letters and Science)

Paul A. Castelfranco, Ph.D., Program Director

Program Office, 912 Sproul Hall (752-1219)

Committee in Charge

Paul A. Castelfranco, Ph.D. *(Botany)*
Richard T. Curley, Ph.D. *(Anthropology)*
Neal W. Gilbert, Ph.D. *(Philosophy)*
Seymour Howard, Ph.D. *(Art History)*
Lincoln D. Hurst, Ph.D. *(Religious Studies)*
Whalen W. Lai, Ph.D. *(Religious Studies)*
Leon H. Mayhew, Ph.D. (Sociology)

NOTE: For key to footnote symbols, see page 123.

Faculty

Neal W. Gilbert, Ph.D., Professor *(Philosophy)*
Lincoln D. Hurst, Ph.D., Assistant Professor
Whalen W. Lai, Ph.D., Associate Professor
Jonathan L. Seidel, M.A., Visiting Lecturer

The Major Program

Majoring in Religious Studies provides an opportunity to explore and analyze the written and oral traditions of the world's great religions: Eastern (Hinduism, Buddhism, Taoism, Confuscianism), Western (Judaism, Christianity, and Islam), ancient (Egyptian, Mesopotamian), and modern (contemporary American religions). The program takes a rigorously academic approach to the study of these religions.

In addition to studying the abstract aspects of religious thought, students in the major also study the practical questions of how religion has shaped human behavior within cultures in matters such as family life, ideas of right and wrong, sexual roles and relations, relations between individuals and society, relations between one society and another, and artistic expression. The student majoring in Religious Studies is offered a broad choice of courses in departments in the College of Letters and Science including Anthropology, Art, Comparative literature, English, German, History, Music, Philosophy, Russian, and Sociology.

The program provides training in reading critically and analytically, and encourages speculative thought on such primal questions as the purpose and meaning of human existence. Courses offered by the Religious Studies faculty emphasize close analysis of texts and therefore train minds rather than test memories. By focusing on the interactions between different traditions, the courses explore the foundations of each tradition and seek an understanding of the complexities, uniqueness, and similarities of the various religions.

Religious Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**34-36**
History 2, 4A, and 9A or 9B	12
Philosophy 21 or Religious Studies 75	3-4
One course from Art 1B, 1D, 20, Comparative Literature 1, 6, 15, 53A, 53B	3-4
Religious Studies 4A, 4B, 21, 40	16
Depth Subject Matter	**45-47**
Religious Studies 193	5
Additonal upper division units of religious studies courses	24-26
(a) theological area, at least 4 units (Religious Studies 125, 126A, 126B, 126C, 140, 168, 172)	4-6
(b) historical area, at least 4 units (Religious Studies 102, 124)	4
(c) 4 units each from Jewish studies, Christian studies, Oriental religions, and general religious studies (Religious Studies 100, 110, 122, 189)	16
Religions and the arts, at least one course (Art 150, 151, 152, 176A, 176B, 176C, 177A, 178A, 178B, Comparative Literature 159F, 161C, 164A, 164B, 164C, 164D, 168A, 168B, English 171A, 171B, German 113, 114, Music 110C, 110D, Russian 140, 141, 150, 154)	4
History of religion from historical point of view, one course (History 102, 111A, 111B, 111C, 121A, 121B, 121C, 130A, 130B, 130C, 131A, 131B, 131C, 143, 144, 147A, 147B, 147C, 175A, 175B, 175C, 176B, 191A, 194A)	4
Philosophy, one course from Philosophy 100, 105, 114A, 114B, 143, 145, 146, 151, 159	4
Social Scientist's approach to study of religion, one course (Anthropology 124, Sociology 146)	4
Total Units for the Major	**79-83**

Course Equivalents
The major advisers have a list of lower and upper division courses that can be substituted for courses suggested above.

Recommended
Anthropology 2; Classics 10, 41; Philosophy 1. A reading knowledge of a foreign language is highly recommended. Consult major adviser for a complete list of recommended upper division courses.

Major Advisers. L.D. Hurst.

Minor Program Requirements:

The following four minor program options and others responsive to students' needs are subject to approval by the major adviser or the Curriculum Committee.

	UNITS
Religious Studies	**20**
Religious Studies emphasis	**20**
Five courses chosen from Religious Studies 102, 110, 122, 124, 140, 168, 172	20

	UNITS
Oriental Religions emphasis	**20**
Religious Studies 70, 168, 172; and two courses from Religious Studies 110, History 191A, 194A	20

	UNITS
Judaism emphasis	**20**
Religious Studies 23, 122, 124	12
Two additional courses from Religious Studies 110, History 143A, 144C	8
(Religious Studies 122 and 124 may be repeated for credit in a different subject area, and the second election can replace one of the above three courses.)	

	UNITS
Christian Studies emphasis	**20**
Religious Studies 40, 102, 140, and two courses from Religious Studies 110, Philosophy 145, History 130A, 130B, 130C, 131B	20

Preministerial Training

Seminaries and professional theological schools, as a rule, do not prescribe any specific major program and give equal consideration to all qualified applicants completing a course of study that gives them a broad cultural background. A program combining the Preparatory Subject Matter for the A.B. degree in Religious Studies, with one of the A.B. degree curricula in the humanities and social sciences is an excellent preparation for most seminaries and professional theological schools. A reading knowledge of a foreign language is highly recommended.

Students interested in applying for admission to a theological school should consult the Religious Studies office and make an appointment with the preministerial adviser.

Preministerial Adviser. L. D. Hurst.

Courses in Hebrew

Lower Division Courses

1. Elementary Modern Hebrew (5) I. The Staff (Chairperson in charge)
Recitation—4 hours; laboratory—2 hours. Introduction to modern written and spoken Hebrew. (Students who have successfully completed Hebrew 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1AT. Individualized Elementary Hebrew (5) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; laboratory—8 hours. Introduction to modern written and spoken Hebrew. Parallels material of course 1. Individualized instruction by videotape. (Students who have successfully completed Hebrew 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Modern Hebrew (5) II. The Staff (Chairperson in charge)
Recitation—4 hours; laboratory—2 hours. Prerequisite: course 1 or 1AT. Introduction to modern written and spoken Hebrew. Continuation of course 1.

2AT. Individualized Elementary Hebrew (5) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour; laboratory—8 hours. Prerequisite: course 1 or 1AT or consent of instructor. Introduction to modern written and spoken Hebrew. Parallels material of course 2. Individualized instruction by videotape.

3. Elementary Modern Hebrew (5) III. The Staff (Chairperson in charge)
Recitation—4 hours; laboratory—2 hours. Prerequisite: course 2 or 2AT. Introduction to modern written and spoken Hebrew. Continuation of course 2.

Courses in Religious Studies

Lower Division Courses

1. Survey of Religion (3) II. Hurst
Lecture—3 hours. Basic concepts introduced through readings of the primary religious literature. Discussion of central ideas (creation, history, law, prophecy, suffering, mysticism, asceticism, karma, reincarnation, moksha, etc.); readings from the Bible, Bhagavad Gita, Koran, and selections from Plato and early Buddhist writings.

2. Myth, Ritual, and Symbolism (3) III. Seidel
Lecture—3 hours. Exploration of myths, rituals and religious symbols found in a variety of religious traditions including examples from ancient and contemporary religious life. The variety of religious phenomena; validity of different approaches to the study of religion.

4A. World Religions (4) I, Lai
Lecture—3 hours; discussion—1 hour. Eastern religions, including Hinduism, Buddhism and Taoism from their origins to the present.

4B. World Religions (4) II. Seidel
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. Topic of importance in more than one religious tradition as an illustration of the problems and methods of religious studies. May be repeated for credit in a different subject area.

21. Old Testament (4) I, Seidel
Lecture-discussion—4 hours. Religion of Ancient Israel from the time of Abraham to the post-exilic period, as contained in the Hebrew Bible. Emphasis on such key Biblical themes and institutions as: monotheism, revelation, law, covenant, holiness, creation, prophecy, priesthood, wisdom, and apocalypse.

23. Basic Judaism (4) II. Seidel
Lecture-discussion—4 hours. General overview of the traditional laws and customs of Judaism, with an introduction to the history, ethics, and underlying beliefs of Judaism. Course requires no prior knowledge of Judaism.

40. New Testament (4) I, III. Hurst
Lecture—3 hours; discussion—1 hour. New Testament literature from critical, historical and theological perspectives.

***60. Introduction to Islam** (4) II. The Staff
Lecture—4 hours. Basic beliefs and institutions of Islam. Topics include: Muhammad and the Qur'an; Islamic law, theology, and mysticism; relationship to Judaism and Christianity; Islamic sects; position of women; Islam and politics. Offered in even-numbered years.

***70. Introduction to Buddhism** (4) II. Lai
Lecture—3 hours; term paper (30 hours minimum preparation). Lectures, readings, and discussions on the development of Buddhism in India, China, and Japan; its influence on various Far Eastern art forms.

75. Chinese Philosophy: An Introduction (3) III. Lai
Lecture—2 hours; discussion—1 hour. Introduction to Chinese philosophy from Classical to Modern times: emphasis on basic metaphysics and its change over time, including Confucian humanism, Taoist cosmologics, the Han synthesis of Tao, Yin-yang and Five Elements; its impact on Buddhism, Sung new synthesis and conflict with the West. Offered in odd-numbered years.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Special Study for Lower-Division Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

Upper Division Courses

***100. Study of Religion: Issues and Methods** (4) II. The Staff (Chairperson in charge)
Lecture-discussion—3 hours; term paper. Principal issues and methods of Religious Studies and associated fields.

102. Christian Origins (4) I, Hurst
Lecture-discussion—3 hours; term paper. Prerequisite: course 40; course 23 recommended. Beginning of the Christian faith seen in relation to milieu in which it originated. Offered in odd-numbered years.

110. Religious Biographies (4) II. Gilbert
Lecture-discussion—3 hours; term paper. Lives of selected religious leaders representative of different religious temperaments and historical traditions.

115. Mysticism (4) III. Lai
Lecture-discussion—4 hours. Prerequisite: one lower division Religious Studies course (except 10, 98, or 99). Course intended primarily for Religious Studies majors, with others admitted. Historical and descriptive analysis of selected mystical traditions, and of selected key figures; readings of representative mystical authors. Offered every 3 or 4 years.

122. Studies in Biblical Texts (4) III. Seidel
Lecture—3 hours; term paper. Prerequisite: course 21. Study of a book from the Prophets or Writings from critical, historical, and religious perspectives. May be repeated once for credit in different subject area.

***124. Topics in Judaism** (4) III. Seidel
Lecture—3 hours; term paper. Prerequisite: course 23. Examination of selected aspects of Jewish life, religion, or literature. May be repeated once for credit in different subject area.

***125. Talmud** (4) II. Seidel
Lecture—3 hours; term paper. Prerequisite: course 23. Introduction to the Talmud covering: history of the Talmudic literature; types of Talmudic materials with special reference to narrative and law; place of the Talmud in Jewish life.

***126A. Readings from the Rabbinic Literature** (2) III. Seidel
Seminar—2 hours. Prerequisite: course 125 or consent of instructor; reading knowledge of Hebrew helpful. Examination of selected Rabbinic texts from critical, historical, and theological perspectives. Texts relating to Biblical themes. (P/NP grading only.)

***126B. Readings from the Rabbinic Literature** (2) III. Seidel
Seminar—2 hours. Prerequisite: course 125 or consent of instructor; reading knowledge of Hebrew helpful. Continuation of course 126A. Texts relating to the Second Commonwealth. (P/NP grading only.)

***126C. Readings from the Rabbinic Literature** (2) III. Seidel
Seminar—2 hours. Prerequisite: course 125 or consent of instructor; reading knowledge of Hebrew helpful. Continuation of course 126B. Texts relating to the period of the Amoraim. (P/NP grading only.)

***140. Christian Theology** (4) I, Hurst
Lecture—3 hours; term paper. Prerequisite: course 40; course 102 recommended. Historical and systematic introduction to Christian doctrine, with attention to divergent traditions and the problem of orthodoxy and heresy.

***141A. New Testament Literature** (4) II. Hurst
Lecture-discussion—4 hours. Prerequisite: course 40. Life and thought of the early Church as reflected by the Synoptic Tradition—Matthew, Mark, Luke and Acts. Offered every third year beginning Winter 1984 to alternate with 141B, 141C.

141B. New Testament Literature (4) II. Hurst
Lecture-discussion—4 hours. Prerequisite: course 40. Life and thought of the early Church as reflected by the Johannine Tradition—the Gospel and letters of John. Offered every third year beginning Winter 1985 to alternate with 141A, 141C.

***141C. New Testament Literature** (4) II. Hurst
Lecture-discussion—4 hours. Prerequisite: course 40. Life and thought of the early Church as reflected by the Pauline tradition—the letters of Paul. Offered every third year beginning Winter 1983 to alternate with 141A, 141B.

***145. Contemporary American Religion** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 40 and History 17B recommended. Examination of several major movements and phenomena in twentieth-century American religion. Offered in odd-numbered years.

***150. Religious Ethics** (4) III. Lai
Lecture-discussion—4 hours. Prerequisite: course 4A or 4B. Study of the religious bases to ethics through concentration on the ethical tracts of one major tradition, or through a comparison of the attitudes of two or more traditions to a common ethical issue. Offered every three years (next offering, Spring 1986).

168. Hinduism (4) I, Lai
Lecture—3 hours; term paper (30 hours minimum preparation). Prerequisite: course 4A. Hindu tradition from ancient to modern times. Multiplicity of religious forms within Hinduism with mention of Jainism, Buddhism and Sikhism and their relation to main stream of Hindu religion. Offered in even-numbered years.

***172. Ch'an (Zen) Buddhism** (4) I, Lai
Lecture-discussion—3 hours; term paper. Prerequisite: course 4A recommended. Doctrines and methods of the Patriarchs and great masters, both ancient and modern in the framework of the orthodox Buddhist tradition. Doctrinal basis of meditational techniques.

189. Senior Colloquium (4) II. The Staff (Chairperson in charge)
Seminar—3 hours; term paper. Prerequisite: consent of instructor. Primarily for seniors in Religious Studies. Discussion in depth of a problem in religion which requires the methods of several disciplines and is important in the encounter between religions.

193. Proseminar (5) I, II, III. The Staff (Chairperson in charge)
Supervised research—15 hours. Prerequisite: open only to seniors majoring in Religious Studies. Preparation of senior thesis on topic selected by student with approval of Religious Studies Curriculum Committee.

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

See Resource Sciences

Reproduction

(School of Veterinary Medicine)

John P. Hughes, D.V.M., Chairperson of the Department

Department Office, 1126 Medical Science I (752-1358)

Faculty

Domenico Bernoco, D.V.M., Libera Docenza, Associate Professor
[2]Robert H. BonDurant, D.V.M., Associate Professor
Ann Trommershausen Bowling, Ph.D., Associate Adjunct Professor
Edward C. Feldman, D.V.M., Associate Professor
John P. Hughes, D.V.M., Professor
Irwin K. M. Liu, D.V.M., Ph.D., Associate Professor
Robert L. Pashen, B.V.Sc., Ph.D., Assistant Professor
George H. Stabenfeldt, D.V.M., Ph.D., Professor
Clyde J. Stormont, Ph.D., Professor Emeritus

Part-Time Clinical Faculty

Robert E. Dickerson, D.V.M., Associate Clinical Professor
Robert J. Harris, D.V.M., Associate Clinical Professor
James R. Howard, D.V.M., Ph.D., Associate Clinical Professor
Michael G. Kerfoot, D.V.M., Assistant Clinical Professor
Gregory A. Ledbetter, D.V.M., M.P.V.M., Assistant Clinical Professor
Gerald R. Mitchell, D.V.M., Associate Clinical Professor
Frank A. Mongini, D.V.M., Associate Clinical Professor
Jack W. Morse, D.V.M., Associate Clinical Professor
Frank N. Walton, D.V.M., Assistant Clinical Professor
John E. Zimmerman, D.V.M., Assistant Clinical Professor

Courses in Reproduction

Upper Division Courses

111. Immunogenetic and Electrophoretic Techniques (2) I, Bernoco
Lecture—1 hour; laboratory—3 hours. Prerequisite: Genetics 100A-100B (or the equivalent), or consent of instructor. Immunologic and electrophoretic techniques used in the exploration of heritable differences in red cell antigens, serum proteins and enzymes of domestic animals.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Hughes in charge)
(P/NP grading only.)

Graduate Courses

231. Pathophysiology of Mammalian Reproductive Processes (3) III. Stabenfeldt
Lecture—3 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor. Physiological and pathological aspects of reproductive failure in mammals concerning gonadal function, fertilization, implantation, prenatal mortality, neonatal mortality, environmental factors, anatomical and hereditary defects, intersexuality and behavior. Offered in odd-numbered years.

234. Applied Dairy Cattle Nutrition (2) III. The Staff
Lecture—2 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine. Application of basic nutritional principles to practical dairy cattle feeding and use of computers to formulate rations based on optimum nutritional and economic value. Lectures supplemented with visits to dairy farms to evaluate feeding programs.

***290. Seminar** (1) I, II, III. The Staff (Hughes in charge)

292. Current Topics in Reproduction (1) I, II, III. The Staff (Stabenfeldt in charge)
Seminar—1 hour. Prerequisite: consent of instructor. Discussion of current scientific literature in reproduction, as well as presentation of research findings by graduate students and faculty. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Hughes in charge)

299. (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Course

424. Theriogenology of Farm Animals (1½ per week) I, II, III. The Staff (BonDurant 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 indepth study of individual animal disease problems. Seminar participation required. May be repeated for credit. (S/U grading only.)

Resource Sciences

(College of Agricultural and Environmental Sciences)

Faculty

See under departments of Agricultural Economics, Agronomy and Range Science, and Land, Air and Water Resources.

The Major Program

The Resource Sciences major is a program for study of the physical, chemical and biological features of renewable natural resources, and the economic and social considerations associated with their use, protection, and management. Students who choose this major include those with interest in careers associated with resource utilization and management, and those in post-baccalaureate, academic, or professional training.

The curriculum for the major provides flexibility in meeting individual needs, interests, and objectives. But, at the same time, certain courses are required in the basic physical and biological science areas,

NOTE: For key to footnote symbols, see page 123.

and in the subject matter area. An upper division general resource sciences course, a resource economics course, and a specified number of units of resource-oriented courses are required for all students in the major. Resource-oriented courses shall be selected in consultation with and with the approval of the student's adviser. Considerable care should be taken to insure effective utilization of the flexibility of the major, to meet individual academic and career objectives. In addition, supportive courses are specified to acquire additional knowledge and skills.

Positions now held by graduates in Resource Sciences are quite varied, but many are employed as resource analysts and planners as well as technical staff specialists with government agencies, municipalities and private firms. A significant number of graduates have undertaken further studies leading to advanced degrees in resources, environment and related fields.

Resource Sciences

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *(Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**73**
English or English and rhetoric (see college requirements, page 71)	8
Chemistry (Chemistry 1A, 1B)	10
Physics 2A, 2B, 2C	9
Mathematics and statistics (Mathematics 16A, 16B, Statistics 13)	10
Computer science (Agricultural Science and Management 21, Computer Science Engineering 8, Engineering 5)	3
Biology (Biological Sciences 1)	5
Animal and/or plant science	6
Atmospheric science (Atmospheric Science 20 or Geography 3)	3
Geology or physical geography	3
Additional courses in biological, physical and computer sciences, and in mathematics to be selected with adviser's approval (Botany 2, Zoology 2, Chemistry 8A, 8B, Mathematics 16C)	16
Depth Subject Matter	**54–58**
Resource Sciences 100	4
Soil and water science (Soil Science 100, Water Science 100)	8
Agricultural Economics 147 or 148	3-4
Resource-oriented courses selected with adviser's approval	24
Written expression (in addition to college requirement)	3
Quantitive skills (Agricultural Science and Management 150, Environmental Studies 123, Statistics 106, 108)	3-4
Social-political awareness in resource sciences (Environmental Studies 160, 161; Environmental Toxicology 138, Geography 161, Geology 134, Water Science 150, Wildlife and Fisheries Biology 151)	3-4
Plant or animal ecology (Botany 117, Entomology 104, Environmental Studies 100, Plant Science 101, Zoology 125)	3-4
Special study or internship (Resource Sciences 190, 192, 198, 199)	3
Breadth Subject Matter	**21**
Social sciences and humanities electives	12
At least one upper division course from three of the following areas: Agricultural economics, agronomy, animal science, botany, civil or agricultural engineering, economics, environmental horticulture, environmental planning and management, environmental studies, environmental toxicology, geography, geology, plant sciences, range management, resource sciences, soil science, water science, wildlife and fisheries biology, zoology, or others with adviser's approval.	9
Electives	**32-34**
Total Units for the Major	**180**

Related Courses. For courses that are related to this area see course listings for Agricultural Economics, Agricultural Science and Management, Animal Science, Botany, Entomology, Environmental Planning and Management, Environmental Studies, Environmental Toxicology, Geography, Geology, Range Management, Wildlife and Fisheries Biology, and Zoology.

Major Adviser. R.G. Burau *(Land, Air and Water Resources,* 175 Hoagland Hall).

Advising Center for the major is located in 122 Hoagland Hall (752-1669).

Courses in Resource Sciences

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

2. Concepts in Forestry (2) II. Delwiche.
Lecture—2 hours. An introduction to the concepts of forestry as illustrated by current issues in the western United States.

10. Natural Resources of California (2) III. Walker
Lecture—2 hours. Study of the natural resources of California; topographical influences on climate and resource characteristics; resource interrelationships; the social and economic implications of resource utilization for agriculture, recreation, and urban development.

12. Aerial Study of Natural Resources of California (2) III. Walker
Discussion—2 hours; one Saturday flight. Prerequisite: course 10 (may be taken concurrently) or consent of instructor. Group study of natural resources of California with emphasis directed to resource character and utilization potential. Mid-quarter study of topics via a "flying classroom" enhances a unique learning experience. (Flight fee approximately $60.) Limited enrollment. (P/NP grading only.)

92. Resource Sciences Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. Concepts in Renewable Natural Resources (4) II. Snyder, Walker
Lecture—3 hours; discussion—1 hour. Prerequisite: junior standing or consent of instructor. A survey of renewable natural resources, including relationships among soil, water, air, energy, plants, animals and society. Role of man in resource management, preservation and improvement for provision of food, fiber, environmental enhancement and recreation.

101. Agriculture and Wildlife (3) II. Crampton
Lecture—3 hours; two Saturday field trips. Prerequisite: upper division standing or consent of instructor. Study of the Central California Valley and the Delta region as an example of utilization for production, agriculture, and outdoor recreation—the conflicts and harmonies; lectures by distinguished biologists of the University, and the State Department of Fish and Game.

103. Solar Energy Applications (3) I, Flocchini
Lecture—3 hours. Prerequisite: Mathematics 16B and Atmospheric Science 20. Characteristics of solar energy; energy balance of structures; analysis of systems for heating water and air; air conditioning systems; electricity from the sun; biomass conversion; wind power.

110. Wildflowers of the Central Valley of California (3) III. Crampton
Lecture—3 hours. Prerequisite: Botany 2. Study of the resident plants in and about the Central Valley of California; growth forms, plant communities; identification and systematic relationships, field collections; land use and overall influence on wildflower habitats.

131. Air as a Resource (3) III. Flocchini
Lecture—3 hours. Prerequisite: Mathematics 16A, 16B, and Chemistry 1A. Examination of air as a resource. Constituents of the atmosphere discussed as well as radiation and wind climatology. Degradation in terms of gaseous and particulate air pollution.

190. Seminar on Alternatives in Agriculture (2) II. The Staff (Chairperson in charge)
Seminar—2 hours. Seminar on alternative points of view regarding agronomic, economic and public policy aspects of current and future agricultural systems. (P/NP grading only.)

192. Resource Sciences Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in resource sciences. Internship supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Studies for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

203. Solar Energy Conversion Processes (3) II. Flocchini
Lecture—3 hours. Prerequisite: course 103, Mathematics 16C. Forms of solar energy; solar energy climatology; heat transfer; analysis of systems for space heating and cooling.

Rhetoric

(College of Letters and Science)

James J. Murphy, Ph.D., Chairperson of the Department

Department Office, 224 Academic Office Building-IV (752-1221)

Faculty

Don P. Abbott, Ph.D., Assistant Professor
Mary L. Kahl, M.A., Visiting Lecturer
Martin J. Medhurst, Ph.D., Assistant Professor
Gerald P. Mohrmann, Ph.D., Professor
Mark P. Moore, Ph.D., Visiting Lecturer
Michael T. Motley, Ph.D., Associate Professor
James J. Murphy, Ph.D., Professor
Ralph S. Pomeroy, Ph.D., Associate Professor
Lisa Ray, Ph.D., Visiting Lecturer
Mary Jane Shadowen, M.A., Visiting Lecturer
Susan B. Shimanoff, Ph.D., Assistant Professor
Michael J. Sunnafrank, Ph.D., Assistant Professor
John L. Vohs, M.A., Senior Lecturer

The Major Program

The major in Rhetoric centers on human beings as communicators, on the ways in which messages and their uses influence our lives. Course offerings allow the student to explore all facets of the communication process, from interpersonal communication through the rhetoric of film, and from major theories through the close analysis of particular messages. The centrality of communication in our lives is the basis for the program, and although specific courses may have quite varied emphases, all are designed to focus attention on communication. The sequence of required courses is designed to establish a coherent and systematic foundation from which the student can proceed in ways suited to individual interests. Whatever those interests, the major program can become an organizing principle, and in reporting research, students are asked to use the study of communication as a perspective for understanding themselves and their cultural inheritance.

Because of the general orientation and because communication is so basic to education, rhetoric courses can be profitable to any student in any major, and the profit can extend far beyond the immediate scope of a university education. Students who have majored in rhetoric have found that the program has opened a broad vista of career opportunities. Some have entered the job market di-

NOTE: For key to footnote symbols, see page 123.

rectly and are pursuing careers in journalism, broadcasting, public relations, advertising, personnel, and sales. Some have chosen to do graduate work in the field, others in studies ranging from business administration to law and even to medicine. It is impossible to exhaust the possibilities, for in both public and private sectors, opportunities continue to develop for those who have a sound liberal education and who have prepared themselves with special attention to the uses of communication.

Rhetoric

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**8**
Rhetoric 1, 3	8
Depth Subject Matter	**44**
Rhetoric 110, 114, 120, 153	16
One course from each of the following five groups	20
(a) Rhetoric 103, 105, 107	
(b) Rhetoric 111, 112, 113	
(c) Rhetoric 121, 122, 123, 125	
(d) Rhetoric 130, 134, 136, 152	
(e) Rhetoric 140, 141, 143	
Two additional upper division courses in Rhetoric	8
Total Units for the Major	**52**

Major Advisers. D.P. Abbott, M.J. Medhurst, G.P. Mohrmann, M.T. Motley, J.J. Murphy, R.S. Pomeroy, S.B. Shimanoff, M.J. Sunnafrank, J.L. Vohs.

Minor Program Requirements:

	UNITS
Rhetoric	**24**
One course from Rhetoric 1, 3, 51	4
A coherent sequence of at least five upper division courses in rhetoric selected with the approval of a minor adviser	20

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. M. J. Medhurst.

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.

3. Group Communication (4) I, II, III. The Staff (Chairperson in charge)
Lecture-discussion—4 hours. Study of communication in small group situations. Role of communication in various group processes, including leadership and decision-making. Participation in group activities and simulation exercises.

***10. Introduction to Communication Studies** (3) 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) I. 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. The Staff
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. Rhetorical Research (4) II. Ray
Lecture—2 hours; discussion—2 hours; term paper. Prerequisite: upper division standing or consent of instructor. Methods of reporting research into various aspects of human communication. Weekly assignments in organization and writing of research reports.

103. Analysis of Message Systems (4) II. Shimanoff
Lecture—4 hours. Examination of elements of the communication process, including sources, messages, media, and receivers. Study of the role of these elements as they are influenced by various communicative situations.

105. Semantic and Pragmatic Functions of Language (4) I, Motley
Lecture—4 hours. 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.

107. Conversational Analysis (4) III. Shimanoff
Lecture—4 hours. Examination of research studies on conversations. Methods for collecting, transcribing and recording naturally occuring conversations for analysis. Study of social impact of rule observance and nonobservance.

110. Origins of Rhetoric (4) I, III. Murphy
Lecture—3 hours; discussion—1 hour. Prerequisite: course in ancient history recommended. Issues in the development of rhetoric from its origins in ancient Greece to A.D. 430. Special attention to works of Plato, Aristotle, Cicero, and Quintilian. Role of grammar and rhetoric in schools of Roman Empire. The Christian rhetoric of Saint Augustine.

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. Abbott
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. Abbott
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, II. Ray, Shadowen
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, II, III. Mohrmann, Medhurst
Lecture—4 hours. Survey of critical methods and their use in the interpretation of rhetorical discourse.

121. Public Address in Western Culture (4) I, Kahl
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. Public Discourse in American Culture (4) II. Mohrmann
Lecture—4 hours. Major individuals, movements, and media. Case studies of rhetoric as it has contributed to and is influenced by American culture. Variable content; may be repeated once for credit.

123. The Persuasive Campaign (4) I, III. Moore
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.

125. Freedom of Speech (4) II. Abbott
Lecture-discussion—4 hours. Historical developments of and contemporary controversies in freedom of speech. Political dissent, symbolic speech, slander and obscenity. Offered in odd-numbered years.

130. Group Communication Processes (4) III. Vohs
Lecture—4 hours. Examination of current theories of group formation, goals, structure, and leadership, as they relate to communication processes.

134. Interpersonal Communication (4) I. Sunnafrank
Lecture—4 hours. Prerequisite: course 1, 3, or 10, or the equivalent. Communication between individuals in social and task settings. One-to-one communication, verbal and nonverbal, in developing relationships. Consideration of theory and research on relevant variables such as shyness, self-disclosure, reciprocity, games and conflict.

136. Organizational Communication (4) II. Vohs
Lecture—4 hours. Examines communication in various organizational situations. Focuses on the use of effective communication strategies for achieving organizational and individual goals. Emphasis is placed on identifying and amending ineffective communication within organizations.

140. Mass Communication and the Public (4) I, Medhurst
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)
Lecture—4 hours. Prerequisite: course 153, or the equivalent course in Social Science research methods. Recent developments in the study of mass communications content and effects, with emphasis on the broadcast media. Special attention to the function of television for selected audiences; children, minorities, the aged.

142A. News Policies and Practices in Television (2) III. The Staff (Chairperson in charge)
Lecture—2 hours. Prerequisite: course 140 or 141, or consent of instructor. Processes and constraints in gathering, editing and reporting the news in the broadcast media, as examined by a practicing professional.

***142B. News Policies and Practices in the Press** (2) III. The Staff (Chairperson in charge)
Lecture—2 hours. Prerequisite: course 140 or 141, or consent of instructor. Processes and constraints in gathering, editing and reporting the news in the print media, as examined by a practicing professional.

143. Media Criticism: Broadcast (4) III. Medhurst
Lecture—1 hour; discussion—3 hours; one or two major writing assignments. Analysis, interpretation and evaluation of broadcast media content, employing various critical frameworks including genre studies, mythological and dramaturgical criticism, linguistic analysis, inconographic criticism, and theories of popular culture. Course requirements include one or two major writing assignments.

151. Methods of Advocacy (4) I, II. 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.

152. Persuasion (4) III. Sunnafrank
Lecture—4 hours. Prerequisite: course 114 or 153 recommended. Theory and research on the effectiveness of various communicative techniques used to influence the perceptions and behaviors of others. Focuses on scientific research into the processes or persuasion and resistance to persuasion in various contexts.

153. Empirical Studies in Rhetoric (4) II, III. Motley
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)
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.

192. Internship in Rhetoric (1-12) I, II, III. The Staff
Laboratory—3-36 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.)

194H. Senior Honors Thesis (4) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour; individual tutoring on research project—3 hours. Prerequisite: senior standing and approval by Honors Committee. Honors thesis. Directed reading, research, and writing culminating in the preparation of honors thesis under direction of faculty adviser.

197T. Tutoring in Rhetoric (2-4) I, II, III. The Staff (Chairperson in charge)
Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing with major in rhetoric and consent of Department Chairperson. Tutoring in undergraduate rhetoric courses, including leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit up to six units. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

NOTE: For key to footnote symbols, see page 123.

Graduate Courses

Seniors may take graduate courses with consent of instructor.

(Note: Some course changes are still pending. Contact the Department Office for current information.)

210. Theories of Rhetorical Criticism (3) I, Medhurst
Lecture—1 hour; discussion—2 hours. Exploration of various approaches to the art of critique, including dramatism, fantasy theme analysis, phenomenology, generic studies, and socio-linguistic criticism. Philosophical assumptions, limitations, and potential of each approach is assessed.

212. Advances in Communication Theory (3) II. Sunnafrank
Lecture—3 hours. Introduction to current theories in the field of communication. Various theoritical approaches including covering law, rules, axiomatic, causal, and systems will be covered. Several current theories which exemplify each of these approaches will be examined.

220. Empirical Methods in Communication (4) II. Motley
Lecture—4 hours. Prerequisite: course 153 or consent of instructor. Introduction to the use of experimental and descriptive research methods in communication research. Topics include survey research, interviewing, experimental and quasiexperimental design, and statistics.

222. Practicum in Rhetorical Criticism (3) II. Mohrmann
Seminar—1 hour; individual conferences—2 hours. Prerequisite: course 120 or the equivalent. Intensive analysis of selected persuasive messages. Particular attention to the rhetorical situation and to elements in the rhetorical process.

240. Advocacy in Contemporary Society (3) II. Pomeroy
Seminar—3 hours. Rhetorical and communication theories of argumentation and persuasion. These theoretical perspectives are employed to analyze the persuasive impact of argumentation occuring in current public controversies.

242. Discourse Analysis (3) III. Shimanoff
Seminar—3 hours. Prerequisite: course 107 or consent of instructor. Examination of language in planned and unplanned messages with particular emphasis on oral discourse. Analyses may include investigations of stylistic variations, speech acts, syntactical patterns, topic management, argumentative structures, and communication rules.

244. Communicaton Processes and Problems in Organizations (3) II. Vohs
Seminar—3 hours. Prerequisite: course 130, or the equivalent with consent of instructor. Advanced study of theory and research on communication processes in organizations.

***248. Rhetoric of Film** (4) Medhurst
Seminar—3 hours; laboratory—3 hours. Prerequisite: a course in criticism. Explores the relationship between cinematic forms and the perception and interpretation of those forms by viewers. Films are treated as texts intentionally designed to elicit responses from an audience.

250. Special Topics (3) III. Abbott
Seminar—3 hours. Selected topics in rhetoric and communication. May be repeated once for credit.

260. Communication Applications (3) I, II, III. The Staff (Chairperson in charge)
Lecture—1 hour; laboratory—6 hours; field work under faculty supervision. Field work in communication. May be repeated once for credit. (S/U grading only).

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Russian

(College of Letters and Science)

James Gallant, Ph.D., Vice-Chairperson of the Department

Department Office (German and Russian), 416 Sproul Hall (752-2114)

Faculty

Virginia H. Bennett, Ph.D., Assistant Professor
James Gallant, Ph.D., Associate Professor
Lawrence J. Grant, M.A., Lecturer
Daniel Rancour-Lafferrière, Ph.D., Associate Professor
Valerie A. Tumins, Ph.D., Professor

The Major Program

The Department offers a major in which students may elect to complete one of two emphases, depending upon anticipated career interests. The common basis for both programs is extensive training in the Russian language. The traditional major, the *Russian Literature* emphasis, concentrates on the evaluation of the literary movements and cultural trends that have expressed and shaped the Russian national consciousness. This program prepares students for graduate study in literature and a career in teaching. The second area of study, the *Russian Language* emphasis, focuses on linguistics and practical language skills. This program prepares students for graduate work and, in conjunction with a secondary field of study, such as social or natural science, can lead to a career in government or business.

Russian

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**8-38**
Russian 1 through 6 (or the equivalent)	0-30
Russian 41, 42	8
Recommended, Linguistics 1.	
Depth Subject Matter	**36**
Russian Literature emphasis	
Russian 101A, 101B, 101C	12
Russian 102 or 103 or 105	4
Russian 121, 123	8
Russian 127 or 128	4
Additional upper division units chosen in consultation with adviser	8
Russian Language emphasis	
Russian 101A, 101B, 101C	12
Russian 102 or 105	4
Russian 103 or 104	4
Russian 160	4
Additional upper division units chosen in consultation with adviser	12
Total Units for the Major	**44-74**

Major Adviser. L.J. Grant.

Honors and Honors Program. The honors program comprises at least one quarter of study under course 194H, which will include a research paper. See also page 92.

Minor Program Requirements:

Two minor programs are available to students interested in obtaining a solid background in Russian language or literature. The Literature minor does not require a knowledge of the Russian language. Individual minor programs may be designed in consultation with the undergraduate adviser.

	UNITS
Russian	**20**
Russian Language emphasis	**20**
Russian 6	4
Russian 101A, 101B, 101C	12
One course from Russian 102, 103, 104, 105, 160	4

	UNITS
Russian Literature emphasis	**20**
Russian 41 or 42	4
Russian 121, 123; and 140 or 141	12
One course from Russian 120, 126, 150, 154	4

Teaching Credential Subject Representative. J. Gallant. See page 98 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. V.A. Tumins.

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. Grant and staff
Recitation—5 hours; language laboratory—1 hour. Elementary Russian grammar and conversation. (Students who have successfully completed Russian 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1ATA-1ATB-1ATC. Individualized Russian (2-2-2) I-II-III. Grant
The three segments of course 1AT correspond to course 1. Student-instructor contact consists of individual tutoring and testing periods. Students may start at any time and complete one or more two-unit segments in a given quarter. (Students who have successfully completed the second or more advanced year of high school level work in Russian in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1SC. Individualized Scientific Russian (4) I, II, III. Gallant and staff
Individual tutorials with faculty—3 hours. Survey of Russian grammar with translation exercise designed specifically for science students. Students work individually with faculty, arranging their lessons and tests according to their own schedules.

2. Elementary Russian (6) II, III. Grant and staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 1. Elementary grammar, reading and conversation.

2ATA-2ATB-2ATC. Individualized Russian (2-2-2) I-II-III. Grant
The three segments of course 2AT correspond to course 2. Student-instructor contract consists of individual tutoring and testing periods. Students may start at any time and complete one or more two-unit segments in a given quarter.

2SC. Individualized Scientific Russian (4) I, II, III. Gallant and staff
Individual tutorials with faculty—3 hours. Prerequisite: course 1SC. Continuation of course 1SC. Students work individually with faculty, arranging their lessons and tests according to their own schedules.

3. Elementary Russian (6) III. Grant and staff
Recitation—5 hours; language laboratory—1 hour. Prerequisite: course 2. Elementary grammar, reading, conversation and composition.

3SC. Individualized Scientific Russian (4) I, II, III. Gallant and staff
Individual tutorials with faculty—3 hours. Prerequisite: course 2SC. Continuation of course 2SC. Students work individually with faculty, arranging their lessons and tests according to their own schedules.

4. Intermediate Russian (4) I, Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 3. Grammar review and conversational practice.

5. Intermediate Russian (4) II. Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 4. Grammar review. Introduction to literature. Conversational practice.

6. Intermediate Russian (4) III. Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 5. Grammar review. Intermediate conversation and continued reading of literature.

10. Elementary Conversation (2) II, III. The Staff
Discussion—2 hours. Prerequisite: course 1; course 2 or 3 (concurrently). Conversational practice to improve pronunciation and master spoken idioms. May be repeated for credit up to a maximum of 6 units.

30. Great Russian Writers (in English) (4) III. Grant
Lecture—3 hours; written reports. Introduction to the important prose and dramatic works of such writers as Gogol, Turgenev, Dostoevsky, Tolstoy, Chekhov, Sholokhov, and Pasternak.

41. Survey of Nineteenth-Century Russian Literature (in English) (4) I, Bennett, Rancour-Laferrière
Lecture—3 hours. Introduction to dominant literary trends, major literary figures and landmarks of Russian prose and poetry from the period of Sentimentalism through Romanticism and Realism to the beginnings of Modernism. Offered in even-numbered years.

NOTE: For key to footnote symbols, see page 123.

42. Survey of Twentieth-Century Russian Literature (in English) (4) II. Rancour-Laferrière, Bennett
Lecture—3 hours. Introduction to major literary trends such as Symbolism, Acmeism, Futurism, Neorealism, and Socialist Realism. Readings from representative writers such as Gorky, Bely, Pasternak, Solzhenitsyn, and Tertz. Offered in even-numbered years.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

101A. Advanced Russian (4) I. The Staff
Lecture—2 hours; discussion—1 hour; oral reports. Prerequisite: course 6. Topics in Russian grammar for the advanced student. Reading and discussion of contemporary literary and journalistic texts. Conversation exercises utilizing literary and colloquial variants of current Soviet speech.

101B. Advanced Russian (4) II. The Staff
Lecture—2 hours; discussion—1 hour; oral reports. Prerequisite: course 101A. Topics in Russian grammar for the advanced student. Reading and discussion of contemporary literary and journalistic texts. Conversational exercises utilizing literary and colloquial variants of current Soviet speech.

101C. Advanced Russian (4) III. The Staff
Lecture—2 hours; discussion—1 hour; oral reports. Continuation of course 101B. Topics in Russian grammar for the advanced student. Reading and discussion of contemporary literary and journalistic texts. Conversational exercises utilizing literary and colloquial variants of current Soviet speech.

102. Russian Composition (4) II. The Staff
Discussion—3 hours; individual tutorial with instructor. Prerequisite: course 6. Practice in writing Russian. One composition on a different topic each week. Topics include: history, geography, politics, and literature of Russia; comparison of Soviet and American lifestyles; current events. Conducted in Russian. Offered in odd-numbered years.

103. Literary Translation (4) III. Rancour-Laferrière and staff
Discussion—3 hours. Prerequisite: course 101C. Translation of Russian literary texts into stylistically equivalent idiomatic English. Offered in even-numbered years.

104. Scientific Translation (4) III. Gallant and staff
Discussion—3 hours; individual translation projects—1 hour. Prerequisite: course 101A. Techniques of translating Russian scientific texts. Science students will select articles from their fields of interest; Russian students will work on materials assigned by instructor. Offered in odd-numbered years.

105. Advanced Russian Conversation (4) II. The Staff
Conversation—3 hours; preparation of texts—1 hour. Prerequisite: course 6. Intensive conversational practice and discussion based on current events and contemporary texts. Offered in even-numbered years.

120. Medieval Literature and Eighteenth-Century Classicism (in English) (4) III. Tumins
Lecture—3 hours; discussion—1 hour. Survey of medieval epics, chronicles, and tales; of the early development of prose and of Baroque literature. Also Classicism and Sentimentalism will be studied. Offered in even-numbered years.

121. Nineteenth-Century Russian Prose (in English) (4) II. Rancour-Laferrière, Bennett, Tumins
Lecture—3 hours; term paper. Development of prose from Pushkin and Gogol, through Dostoevsky and Tolstoy, to Maxim Gorky. Other writers are selected sequentially: Turgenev, Goncharov, Pisemsky, Saltykov, Chekhov. Romanticism, the Natural School, critical realism, and psychological realism are covered. Offered in odd-numbered years.

123. Twentieth-Century Russian Prose (in English) (4) II. Rancour-Laferrière, Bennett
Lecture 3 hours; term paper. Examination of various trends including Acmeism, Symbolism, Neorealism, and Socialist Realism in development of prose. Readings from such writers as Gorky, Zamiatin, Sholokhov, Pasternak, and Solzhenitsyn. Offered in even-numbered years.

126. The Russian Theater (in English) (4) III. Bennett, Rancour-Laferrière
Lecture—3 hours; discussion—1 hour. The main works of Russian dramatists from Gogol to the present, including Turgenev, Tolstoy, Chekhov, Gorky, Mayakovsky, Bulgakov, Shvarts. Offered in odd-numbered years.

127. Nineteenth-Century Russian Poetry (4) I, Bennett, Rancour-Laferrière
Discussion—3 hours; term paper. Prerequisite: course 6. Introduction to the principles of Russian versification followed by historical and poetic analysis of the following figures: Derzhavin Zhukovsky, Pushkin, Delvig, Baratynsky, Lermontov, Nekrasov, Tjutchev, and Fet. Conducted in Russian. Offered in odd-numbered years.

128. Twentieth-Century Russian Poetry (4) I. Bennett, Rancour-Laferrière
Discussion—3 hours; term paper. Prerequisite: course 6. Introduction to principles of Russian versification followed by historical and poetic analysis of the following figures: Brjusov, Blok, Akhmatova, Mandelstam, Esenin, Mayakovsky, Khlebnikov, Pasternak, Evtushenko, Voznesensky, and Brodsky. Conducted in Russian. Offered in even-numbered years.

140. Dostoevsky (in English) (4) I, Tumins
Lecture—3 hours. Reading and analysis of Dostoevsky's principal works such as *Crime and Punishment, The Idiot, The Brothers Karamazov,* and *The Diary.* Study of social and political views as reflected in Dostoevsky's works. Offered in even-numbered years.

141. Tolstoy (in English) (4) I, Bennett
Lecture—3 hours. Study of Leo Tolstoy's literary evolution and moral quest. Readings include his *Confession,* a major novel such as *War and Peace* or *Anna Karenina,* and representative shorter fiction. Offered in odd-numbered years.

150. Russian Culture (4) III. Tumins
Discussion—3 hours; term paper. Knowledge of Russian not required. Study of Russian culture in nineteenth and twentieth centuries. Brief introduction of the beginnings up to nineteenth century. Russian art, music, philosophy, church, traditions, and daily life. Offered in odd-numbered years.

154. Russian Folklore (4) III. Bennett
Lecture—3 hours; term paper. Knowledge of Russian not required. Russian folklore, rituals, and history will be analyzed and compared with folklore of other peoples. Sociological implications of attitudes toward family unit, children, etc. Influences of folklore on Russian literature and historiography. Offered in even-numbered years.

160. Russian Phonology and Morphology (4) III. Gallant
Lecture—3 hours; laboratory—1 hour. Prerequisite: courses 101A, 101B, or consent of instructor. Linguistic analysis of the Russian sound system and of Russian word-formation. Offered in odd-numbered years.

192. Research Essay (2) I, II, III. The Staff
Prerequisite: a Russian literature course (may be taken concurrently). A research essay, based on primary and secondary sources, dealing in depth with a topic arising from or related to the prerequisite literature course. May be repeated for credit.

194H. Special Study for Honors Students (5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: open only to honors students. Guided research leading to an honors paper.

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Old Church Slavic (4) I, Gallant
Lecture—3 hours; reading projects. A synchronic and diachronic analysis of Old Church Slavic. Offered in even-numbered years.

202. History of the Russian Language (4) II. Gallant
Seminar—3 hours; individual reading projects—1 hour. Prerequisite: course 200 or consent of instructor. Survey of Russian historical grammar and development of Russian literary language. Reading in the original texts from eleventh to eighteenth century. Offered in odd-numbered years.

204. Descriptive Russian Grammar (4) III. Gallant
Lecture—3 hours; reading projects—1 hour. Introduction to modern Russian phonology and morphology. Offered in even-numbered years.

210A. Style and Syntax (4) I, Bennett, Tumins
Discussion—3 hours; reading projects—1 hour. Examination of stylistic differences between spoken and written Russian.

210B. Style and Syntax (4) II. Tumins, Bennett
Discussion—3 hours; reading projects—1 hour. Prerequisite: course 210A or consent of instructor. Examination of stylistic differences between spoken and written Russian.

210C. Russian Style and Syntax (4) III. Tumins, Bennett
Discussion—3 hours; term paper. Prerequisite: course 210B or consent of instructor. Students present formal papers and talks on political, economical, social, and cultural topics, lead and participate in discussions. Conducted in Russian.

220. Old Russian Literature (4) II. Tumins
Seminar—3 hours. Advanced study of intellectual movements and literary styles of works such as "The Song of Igor's Campaign," "Zadonshchina," Epifany's "Lives," Ivan IV's cycle of epistles. May be repeated for credit when different topics are studied. Offered in even-numbered years.

***221. Eighteenth-Century Russian Literature** (4) II. Tumins
Seminar—3 hours. Advanced study of literary movements and styles in prose or poetry. The works of writers such as Kantemir, Lomonosov, Sumarokov, Radishchev and Karamzin will be analyzed. May be repeated for credit when different topics are studied. Offered in odd-numbered years.

222. Nineteenth-Century Russian Literature (4) I, Bennett, Tumins, Rancour-Laferrière
Seminar—3 hours. Advanced study of the works of one or several writers or movements of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in odd-numbered years.

223. Early Twentieth-Century Russian Literature (4) I, Bennett, Rancour-Laferrière
Seminar—3 hours. Advanced study of one or more of the modernist movements in Russian literature, including Symbolism, Acmeism, and Futurism. May be repeated for credit when different topics studied. Offered in even-numbered years.

224. Soviet Russian Literature (4) III. Rancour-Laferrière
Seminar—3 hours. Analysis of selected works of Russian prose and poetry with particular emphasis on works of extraordinary literary merit or of unusual importance in the development of genres, schools, styles, techniques, and various formal elements. May be repeated for credit when different topics are studied. Offered in odd-numbered years.

***225. Interdisciplinary Seminar on Semiotics** (4) I. Rancour-Laferrière
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Advanced, general survey of forms of communicaton, including: genetic code, animal communication, human verbal and nonverbal communication, esthetic (especially literary) sign systems, and systems of signs in culture. Offered in even-numbered years.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

300. The Teaching of Russian (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: graduate standing or consent of instructor. Workshop in language teaching methods. Students audit classes in progress and teach under faculty supervision. Required of new and prospective teaching assistants.

Scandinavian

(College of Letters and Science)

Department Office (German and Russian), 416 Sproul Hall (752-2114)

Faculty

Fritz Sammern-Frankenegg, Ph.D., Associate Professor *(Swedish, German)*

Course in Scandinavian

Upper Division Course

110. Masterworks of Scandinavian Literature in Translation (4) III. Sammern-Frankenegg
Lecture—3 hours; written reports. Readings in English translation from Icelandic Saga to the present, treating such major authors as Ludvig Holberg, Sören Kierkegaard, Henrik Ibsen, Sigrid Undset, August Strindberg, Selma Lagerlöf, Pär Lagerkvist. Content varies from year to year. May be repeated twice for credit.

Courses in Swedish

Lower Division Courses

1. Elementary Swedish (6) I, Sammern-Frankenegg
Discussion—5 hours; language laboratory—two ½-hour sessions. (Students who have successfully completed, C– or better, Swedish 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Swedish (6) II. Sammern-Frankenegg
Discussion—5 hours; language laboratory—two ½-hour sessions. Prerequisite: course 1.

3. Intermediate Swedish (6) III. Sammern-Frankenegg
Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 2.

NOTE: For key to footnote symbols, see page 123.

4. Intermediate Swedish (4) I. Sammern-Frankenegg
Discussion—3 hours; weekly reports. Prerequisite: course 3. Review of grammatical principles by means of written exercises. Reading and discussion of modern Swedish literary and nonliterary texts.

6A. Spoken Swedish (2) I. Sammern-Frankenegg
Discussion—2 hours. Prerequisite: course 2. Conversational practice based on everyday vocabulary of modern spoken Swedish. (P/NP grading only.)

6B. Spoken Swedish (2) II. Sammern-Frankenegg
Discussion—2 hours. Prerequisite: course 2. Conversational practice based on everyday vocabulary of modern spoken Swedish. (P/NP grading only.)

98. Directed Group Study (1-3) I, II, III. Sammern-Frankenegg
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-3) I, II, III. Sammern-Frankenegg
Prerequisite: consent of instructor. (P/NP grading only.)

Sociology

(College of Letters and Science)

[2,3]Ruth B. Dixon, Ph.D., Chairperson of the Department
Bruce M. Hackett, Ph.D., Acting Chairperson of the Department
Department Office, 113 Young Hall (752-0782)

Faculty

Nicole W. Biggart, Ph.D., Assistant Professor *(Sociology, Administration)*
James C. Cramer, Ph.D., Associate Professor
[3]Ruth B. Dixon, Ph.D., Professor
Bruce M. Hackett, Ph.D., Associate Professor
[1]Gary G. Hamilton, Ph.D., Associate Professor
[2]James P. Hawley, Ph.D., Assistant Professor
Carl C. Jorgensen, Ph.D., Associate Professor
Edwin M. Lemert, Ph.D., Professor Emeritus
John F. Lofland, Ph.D., Professor
Lyn H. Lofland, Ph.D., Associate Professor
Leon H. Mayhew, Ph.D., Professor
Daniel M. Ramirez, Ph.D., Assistant Professor
Julius A. Roth, Ph.D., Professor
John F. Scott, Ph.D., Professor
[2,3]Judith Stacey, Ph.D., Associate Professor
[1]John T. Walton, Ph.D., Professor

The Major Programs

Sociology is the study of human society in all its manifestations. Its aim is to discover the basic processes and structure of human interaction, to identify the main forces that sustain or weaken social groups, and to determine the conditions that transform social life. Sociology, like any science, is a disciplined, intellectual quest for knowledge about the fundamental nature of things.

The Department of Sociology offers two major programs, Sociology and Sociology—Organizational Studies.

The general Sociology major allows students to obtain a broad understanding of the concepts, methods, and theories of sociology. Students selecting this major have some flexibility in creating a program of study suited to their individual interests and needs. Typically students pursue such careers as urban planning and business, as well as graduate work in sociology. Students with a special interest in the areas of Law and Society or Social Welfare may choose a more specialized program of courses and practical experience within the general major. These options are designed to prepare students for careers in such areas as law, corrections, law enforcement, social work, or counseling.

The Sociology—Organizational Studies major is designed to develop a broad understanding of the political, social, and economic organizations that comprise modern society. This major emphasizes a sociological perspective, but incorporates a multidisciplinary field of study. The major introduces students to a range of theories and methods that social scientists use in the analysis of organizations. Majors in Sociology—Organizational Studies will be prepared for a variety of career options, particularly in the field of management. The major has been specifically designed to meet entry requirements for programs of professional training leading to a masters degree in public or private management, and may also lead to further study in any of its major areas.

In addition to the above majors and options, the Department of Sociology offers several programs and opportunities for undergraduates. These include internships, tutorships, research assistantships, and membership in the Undergraduate Sociology Student Association and in the National Sociology Honors Society. The department also sponsors an undergraduate research award.

For more information on the majors and special programs, contact the Departmental Advising Office in 107 Young Hall.

Sociology

A.B. Degree Requirements:

General empahsis:

	UNITS
Preparatory Subject Matter	**25**
Sociology 1, 46A, 46B (or the equivalent)	13
Select 12 units from Anthropology 1, 2, Economics 1A, 1B, History 3, 4B, 4C, 17A, 17B, Philosophy 1, 12, 21, 22, 23, Political Science 1, 2, 3, 4, Psychology 1, 15	12
Depth Subject Matter	**36**
Sociology 165A, 165B	8
Select 8 units from Sociology 126, 140, 180A, or 180B	8
At least 20 additional units in upper division sociology courses to achieve a minimum of 36 units	20
Total Units for the Major (General emphasis)	61

Law and Society option:

	UNITS
Preparatory Subject Matter	**25-27**
Sociology 1, 3, 46A, 46B	17
Two courses from Anthropology 1, 2, Economics 1A, 1B, History 3, 4B, 4C, 17A, 17B, Philosophy 1, 12, 21, 22, 23, Political Science 1, 2, 3, 4, Psychology 1, 15	8-10
Depth Subject Matter	**40**
Sociology 152, 155	8
Sociology 120 or 150	4
At least 4 but not more than 8 units of Sociology 109A, 109B, 109C	4
At least three courses from Sociology 122, 123, 130, 140, 143A or 143B, 156, 165B, 180A or 180B, 185	12
At least 12 additional units in upper division sociology courses to achieve a minimum of 40 units	12
Total Units for the Major (Law and Society option)	**65–67**

Social Welfare option:

	UNITS
Preparatory Subject Matter	**25–27**
Sociology 1, 3, 46A, 46B	17
Two courses from Anthropology 1, 2, Economics 1A, 1B, History 3, 4B, 4C, 17A, 17B, Philosophy 1, 12, 21, 22, 23, Political Science 1, 2, 3, 4, Psychology 1, 15	8–10
Depth Subject Matter	**40**
Sociology 131, 140, 185	12
At least 4 but not more than 8 units of Sociology 109A, 109B, 109C	4
At least one course from Afro-American Studies 100, American Studies 124, 156, 170, 171, Asian American Studies 110, 111, Native American Studies 124, 156, 170, 171, Spanish 124, Sociology 129, 169	4
At least three courses from Sociology 122, 127, 132, 143A or 143B, 152, 154, 156, 165B, 180A or 180B	12
At least 8 additional units in upper division sociology courses to achieve a minimum of 40 units	8
Total Units for the Major (Social Welfare option)	**65–67**

Sociology—Organizational Studies

A.B. Degree Requirements:

	UNITS
Preparatory Subject Matter	**22**
Sociology 1, 46A	9
Economics 1A, 1B	10
Mathematics 16A	3
Recommended: Sociology 40 or Computer Science Engineering 20, Mathematics 16B, 16C	
Depth Subject Matter	**45**
Sociology 180A, 180B	8
Sociology 103	4
Sociology 106 or the equivalent	4
Economics 100	5
Practicum, Sociology 109A, 109B or 109C	4
Applied behavioral science or agricultural economics, at least 4 units from Applied Behavioral Science 162, 163, 164, Agricultural Economics 112	4
History or anthropology, at least 4 units from History 174A, 179, 194D, Anthropology 122	4
Political science, at least 4 units from Political Science 180, 181, 183	4
Psychology or rhetoric, at least 4 units from Psychology 183, Rhetoric 136	4
Sociology, at least 4 units from Sociology 118, 139, 141, 156, 159	4
Total Units for the Major	**67**

Major Advisers. Consult the Departmental Advising Office, 107 Young Hall.

Minor Program Requirements:

The Department of Sociology has established the following minor programs of study which are open to Letters and Science students.

	UNITS
Sociology	**20**
Select 8 units from Sociology 126, 140, 165A, 165B, 180A or 180B	8
Additional upper division units in Sociology	12
Sociology—Social Welfare	**20**
Sociology 185, plus 4 units selected from Sociology 131, 140, 152	8
Four units from Sociology 143A or 143B, 154, 156, 165B, 180A or 180B	4
Additional upper division units selected from Sociology 109A or 109B or 109C, 120, 123, 127, 130, 132	8
Sociology—Law and Society	**20**
Sociology 152, plus 4 units selected from Sociology 120, 150, 155	8
Four units from Sociology 140, 143A or 143B, 165B, 180A or 180B	4
Additional upper division units selected from Sociology 109A or 109B or 109C, 123, 130, 156, 185	8

Minor Advisers. Consult the Departmental Advising Office, 107 Young Hall.

Teacher Credential Subject Representative. Consult the Departmental Advising Office, 107 Young Hall. See page 98 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. Consult the Departmental Advising Office, 107 Young Hall.

Courses in Sociology

Lower Division Courses

1. Introduction to Sociology (5) I, Mayhew; III, the Staff
Lecture—4 hours; discussion—1 hour. Principles and basic concepts of sociology. The study of groups, culture, collective behavior, classes and caste, community and ecology, role, status, and personality.

NOTE: For key to footnote symbols, see page 123.

2. Self and Society (4) II. L. Lofland
Lecture—3 hours; discussion—1 hour. Principles and basic concepts of sociological social psychology. Includes the study of: the character of the self, identity, roles, socialization, identity change, emotion and social interaction.

3. Social Problems (4) I, Cramer; II, Scott
Lecture—3 hours; discussion—1 hour. General sociological consideration of contemporary social problems in relation to sociocultural change and programs for improvement.

25. Sociology of Popular Culture (4) III. Ramirez
Lecture—4 hours. Social mechanisms that shape modern popular culture. High, folk, and mass culture: historical emergence of popular culture. Mass media, commercialization, ideology and cultural styles. Theories and methods for analyzing cultural expressions in pop music, street art, film, television and advertising.

40. Computers and Social Research (2) I, II. Jackson
Lecture—2 hours; exercises. Prerequisite: priority to social and behavioral science majors. Elementary introduction to the use of computers in the social sciences. Topics include use of canned programs such as SPSS and MINITAB, data preparation and elementary analysis, and simulations and games. No prior knowledge of FORTRAN or statistics necessary. Those who have had Engineering 5 or Computer Science Engineering 8 or 20 can receive only 1 unit of credit for Sociology 40. (P/NP grading only.)

46A. Introduction to Social Research (4) I, Roth
Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Examination of the methodological problems of social research. Selection and definition of problems of investigation, data-gathering techniques, and sampling.

46B. Introduction to Social Research (4) II. Jorgensen
Lecture—4 hours. Prerequisite: course 46A. Data-analysis techniques, measurement, scaling, multivariate analysis, and quantitative measures of association.

98. Directed Group Study (1-5) I, II, III. The Staff (Walton in charge)
Prerequisite: consent of instructor. Primarily intended for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Walton in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

***102. Sociology of the Environment** (4) I, Cramer
Lecture—4 hours. Prerequisite: course 3; upper division standing or consent of instructor; course 140 or 156 recommended. Sociological analysis of environmental problems in advanced industrial societies; types of problems and their causes; population growth and affluence; social class, life styles, and the environmental movement; impacts of environmental changes on social institutions and structures, e.g., family, economy, stratification, cities.

***103. Evaluation Research Methods** (5) III. Cramer
Lecture—3 hours; discussion—1 hour or field research (decided by instructor each timecourse offered). Prerequisite: course 46A and course 46B or Statistics 13 or the equivalent. Surveys applications of research methods to the evaluation of social programs, primarily emphasizing methodological issues, e.g., research design and data collection; uses of evaluation research are also discussed and placed in theoretical context. Participation in an evaluation project.

106. Intermediate Social Statistics (4) I, Dixon
Lecture—4 hours. Prerequisite: course 46B or Statistics 13 or the equivalent. Intermediate level course in statistical analysis of social data, emphasizing the logic and use of statistical measures, procedures and mathematical models especially relevant to sociological analysis.

***107. Seminar in Sociological Analysis** (4) I, 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.

109A-109B-109C. Practicum in Sociological Analysis (4-4-4) I, the Staff; II, Roth; III, Jorgenson
Seminar—2 hours; fieldwork. Prerequisite: upper division standing or consent of instructor. Research and analysis of social settings; designed to give students practical field experience in as well as analytical training for analyzing, an institutional setting. May be repeated for credit; a maximum of 8 units may be counted towards major.

110. Sociology of Chicano Culture (4) I, Ramirez
Lecture—3 hours; research project. Mexican-American culture is examined in relation to the American social structure. Cultural conflict and the origins of cultural nationalism among Mexican-Americans. Emphasis on Mexican-American symbol systems and the problem of self-identity.

118. Political Sociology (4) II. Hawley
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) I, Hawley
Lecture—4 hours. Prerequisite: course 1. Relationship of military institutions to the political, economic, and class structure of historic and contemporary societies. The impact of professionalism and bureaucratic organization. The application of social theory to the analysis of such phenomena as militarism, the *coup d'etat*, revolutionary war, etc.

120. Deviation and Society (4) I, Lemert
Lecture—4 hours. Theory and studies of deviation in relation to societal reaction, group processes and social roles. Stigma and incapacity; cosmetic defect. Deviation theory applied to selected crimes, prostitution, drugs, alcohol use, and mental disorders. Creativity and society.

122. Sociology of Adolescence (4) I. The Staff
Lecture—4 hours. Chronological age and social status; analysis of social processes bearing upon the socialization of children and adolescents. The emergence of "youth cultures." Generational succession as a cultural problem.

123. American Society (4) I, Scott
Lecture—4 hours; essay take-home examinations. The demographic and social structure of American society and population, with emphasis on ethnic and class groups as bases for political and economic interest. Attention to selected current social controversies.

***124. Sociology of Education** (4) I, Scott
Lecture—3 hours; term paper or discussion—1 hour (determined by instructor for each offering). Education and the social structure. Class size, curriculum, and economies of scale. Relations between families and schools in socialization; familial ascription and educational achievement. Education and industrialization. Organizational and occupational structure of schools. Discussion of selected controversies.

***125. Sociology of Intellectual Life** (4) I, Mayhew
Lecture—4 hours. Sociological analysis of the intelligentsia; types of intellectuals, theories concerning their social role; research on the social sources of intellectual work in politics, literature, art and science; historical considerations of intellectual milieu; international comparisons of intellectuals.

126. Social Interaction (4) I. The Staff
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) I, L. Lofland
Lecture—3 hours; discussion—1 hour or term paper or project (determined by instructor for each offering). Overview of attitudes toward, structural effects of, and methods of coping with, death and death-related behaviors. Particular attention to social psychological aspects of death and dying, to death occupations and to death rituals in various cultures.

***128. Interracial Interpersonal Dynamics** (4) III. Jorgensen
Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: one course from courses 1, 2, 3, Afro-American Studies 10, Asian American Studies 1, 2, Chicano Studies 10, Native American Studies 1, 20. Analysis of the influences of cultural differences and racial stratification on interpersonal interaction in instrumental settings (e.g., work, education, political action) and intimate settings (e.g., friendship, love, marriage, family). Minority/majority relationships. Offered in even-numbered years.

129. Sociology of Black Experience in America (4) II. Jorgensen
Lecture—3 hours; discussion, research, or term paper (determined by instructor for each offering). Survey of historical and contemporary theoretical sociological perspectives on the Black experience in United States. Emphasis on comparisons of Black sociological perspectives and mainstream perspectives of specific sociologists. Offered in odd-numbered years.

130. Race Relations (4) I, Jorgensen
Lecture—4 hours. Functions of the social definitions of *race* and *racial* groups. Analysis of *racial* conflict, oppression, and other forms of ethnic stratification. Models of ethnic interaction and social change. Emphasis on *racial* relationships within the U.S.

131. The Family (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Contemporary family life in historical and cross-cultural perspective. How different family forms arose, their significance today and prospects for further family change. Attention to power relations within and beyond the family and to the social implications of family transformation.

132. The Sociology of Sex Roles (4) II. The Staff
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.

133. Sexual Stratification and Politics (4) III. Stacey
Lecture—3 hours; discussion—1 hour. Prerequisite: course 132 or the equivalent or consent of instructor. Analysis of origins, dynamics, and social implications of sexual stratification. Examination of classical and contemporary theorists such as Engels, Freud, J.S. Mill, de Beauvoir, Juliet Mitchell, D. Dinnerstein. Attention to selected issues in social movements for and against sexual equality.

139. Corporations and Society (4) III. Hawley
Lecture—3 hours; research project—1 hour. The study of the history and power of the modern corporation; corporate organization; politics, the state, and the corporation; labor unions and the labor process; competition, regulation and international markets; the multinational and conglomerate corporation; and mass markets and consumerism.

140. Social Stratification (4) I, Scott
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. Hamilton
Lecture—4 hours. Selected technological and social factors. Preconditions of economic development and industrialization. Social, political and cultural issues at various levels of economic development. Major historical differences and major current trends. Emphasis either on highly industrialized countries or on less developed countries.

142. Sociology of Transportation (4) III. Scott
Lecture—3 hours. Sociological factors in transportation. Consequences of transport mode development on social organization, sociological influences in transport mode choice. Transportation issues in public policy.

143A. Urban Society (4) III. L. Lofland
Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: course 1 or the equivalent. Theories of city origins. Analysis of the historic process of urbanization and of varying city types. Comparison of American and European experience of metropolitanization, counterurbanization and neighborhood change. Consideration of competing theories of urban growth and change and competing visions of the urban future. Offered in odd-numbered years.

***143B. Sociology of City Life** (4) III. L. Lofland
Lecture—3 hours; disucssion—1 hour or term paper or project (instructor's option). Prerequisite: course 1 or the equivalent; course 143A recommended. Critical dissection of the "loss of community" issue. Analysis of the organization of primary ties in the city, of the culture of urban public life and of the learning of city skills. Offered in even-numbered years.

***144. Agriculture and Society** (4) III. Hamilton
Lecture—4 hours. Prerequisite: advanced standing in the social sciences or one year of course work in agricultural and environmental sciences. Development of agriculture as a major enterprise in modern society with the concomitant reduction in the labor force and family farms. Analysis of issues including mechanization, migrant labor, corporate farming, and public resource policy.

***145. Urbanization and Development** (4) I, Dixon
Lecture—3 hours; discussion—1 hour; term paper or project. Prerequisite: upper division status. Comparative and historical analysis of the role of urbanization in the development of industrialized and third-world societies focused on social, economic, demographic and political implications.

146. Sociology of Religion (4) II. Mayhew
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. J. Lofland
Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: course 1 or the equivalent. Study of behavior of human crowds and masses in extraordinary circumstances, including crowd panics, mass scares, collective protests, riots, revolutionary situations, ecstatic and revivalist gatherings, crazes, fads, and fashions.

150. Criminology (4) III. The Staff
Lecture—4 hours. Sociological analysis of criminal behavior in relation to social structure and the criminalization process.

NOTE: For key to footnote symbols, see page 123.

152. Juvenile Delinquency (4) II. The Staff
Lecture—4 hours. Study of juvenile delinquency in relation to the family, peer groups, community, and institutional structures. Consideration of processing of the delinquent by formal agencies of control.

154. Sociology of Health Care (4) II. 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) II. The Staff
Lecture—4 hours. Law considered as social control; relation of legal institutions to society as affecting judicial decision making and administration of justice. Lawyers as an occupational group. Legal reform.

156. Social Movements (4) II. J. Lofland
Lecture—3 hours; discussion—1 hour or term paper or project (to be decided by instructor each time course is offered). Analysis of several aspects of social movements: mobilization, forms of organization, ideology recruitment, leadership, strategies and tactics, development, effects. Frequent use of sound and film materials.

157. Social Conflict (4) I, J. Lofland
Lecture—3 hours; discussion—1 hour or term paper or project (instructor's option). Prerequisite: upper division standing or completion of course 1. Analysis of the causes, dynamics, and regulation of social conflict within and between various kinds of social groupings with particular reference to nonviolent methods of waging and regulating conflict.

***158. Consumer-Vendor Relationships** (4) III. Roth
Lecture—3 hours; discussion—1 hour. Examine the relationship between consumers and the vendors of goods and services using case materials, student projects, and relevant literature in sociology and related fields. Emphasis will be on organizational structure and bargaining power.

159. Sociology of Occupations (4) III. Roth
Lecture—4 hours. The natural history of occupations; the institutional matrix of occupations; colleague and client relationships; occupational social controls; career lines, and occupational-related self-definitions; occupational politics.

165A. Sociological Theory (4) I, Ramirez
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.

169. Research in the Chicano Community (4) II. The Staff
Lecture—3 hours; research project. Prerequisite: course 46A. Problems of understanding the Mexican-American in various types of social settings: how to conduct social research in such settings. Conceptual and data gathering problems peculiar to this area of study, and developing strategies and skills for overcoming them.

***170. Population** (4) III. Dixon
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. Walton
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 Mass Communication** (4) II. Biggart
Lecture—3 hours; discussion—1 hour or term paper (to be decided by instructor). Prerequisite: course 1 or the equivalent. Examines the relationship between the media and social structures. History of media-state relations. Media as reflector and shaper of values. Emphasis is on current European, Marxist and pluralist theories rather than content analysis. Offered in even-numbered years.

176. Sociology of Knowledge (4) II. Hackett
Lecture—4 hours. Critical analysis of the social foundations of knowledge in society. The history, problems, and dilemmas in classical sociology of knowledge. Contemporary applications. Natural and social sciences as social systems. Sociology of personal knowledge in every day life.

180A. Complex Organizations (4) II. Biggart
Lecture—4 hours. Prerequisite: course 1; Economics 1A and 1B recommended. Develops a sociological approach to organizations theory. Designed to introduce sociological concepts, address the alternative psychological and economic models, and involve students in the practice of organizational analysis.

180B. Complex Organizations (4) III. Hackett
Lecture—4 hours. Prerequisite: course 180A or consent of instructor. Builds on concepts and skills developed in course 180A. Deals with the issues of organizational decision making, design, and survival. Emphasis on relations between organizations and the effects of those relations in both the public and private sectors.

***182. Experimental and Utopian Communities** (4) III. Hackett
Lecture—3 hours; discussion—1 hour. The social structure of intentional, experimental or Utopian settlements and communitarian movements, including comparison with other small settlement forms: villages, neighborhoods, monasteries, encampments and nonsettlement communities based on occupation, ethnicity, and religion.

185. Sociology of Social Welfare (4) III. Hawley
Lecture—4 hours. A sociological analysis of the evolution and current organization of welfare functions in modern societies.

***189. Social Science Writing** (4) I, Walton
Seminar—4 hours. Prerequisite: course 46A, upper division standing, and 12 units of social science. Improved analytic writing and methods for reporting social science research to a wider public. Sociological analysis of the conditions of good and bad writing. Offered in odd-numbered years

197T. Tutoring in Sociology (1-4) I, II, III. The Staff
Tutorial—3-12 hours. Prerequisite: upper division standing; completion of appropriate course with distinciton. Activities vary depending on the nature of the course assignment. May include (but not limited to) tutoring on course material, advising on projects and papers, and leading discussion groups. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Walton in charge)
Prerequisite: open to seniors only. (P/NP grading only.)

Graduate Courses

***205. Methodological Critique of Research** (4) III.
Lecture—4 hours. Methodological analysis and criticism of empirical research exemplifying different types of research design. Examination of surveys, experiments, historical and comparative studies, and studies using biographical and demographic data.

207A-207B. Methods of Quantitative Research (4-4) II-III. Cramer
Lecture—3 hours; paper. Prerequisite: course 106 or the equivalent. Principles of study design, examination of measurement, survey research methods and multivariate analysis. Course will stress actual practice of techniques. Students will carry out quantitative data analysis using packaged computer programs. (Deferred grading only, pending completion of sequence.)

***215. Economy, Polity and Society** (4) I, Hawley
Seminar—3 hours; paper. Prerequisite: consent of instructor. Open to graduate students in sociology and related disciplines. Course introduces students to topics and selected issues in the related fields of economic and political sociology and political economy.

***219A-219B. Behavioral Political Sociology** (4-4) I-II. The Staff
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) II 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) I.
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) I, L. Lofland
Seminar—3 hours; seminar paper—1 hour. Prerequisite: graduate standing or consent of instructor. Advanced study of the varying approaches, methods, issues and topical concerns of sociological social psychology. Analysis of central and representative historical and contemporary works.

***230. Ethnic (Race) Relations** (4) III. Jorgensen
Lecture—3 hours; paper. Advanced study of the determinants of ethnic groupings and their interrelationships. Major theme will be the patterns of ethnic stratification and causes of ethnic conflict. Specific focus upon dominance and resistance to dominance. Influence of social science research.

***234. Gender, Family and Society** (4) I, Stacey
Seminar—3 hours; seminar paper—1 hour. Prerequisite: graduate standing or consent of instructor. The major theoretical traditions and concerns in family sociology and sociology of gender. Analysis of selected classical and contemporary works representative of functionalist, Marxist, psychoanalytic, feminist and critical theoretical approaches to these subjects (e.g., Engles, Parsons, Freud, Horkheimer, Goode, Lasch, Mitchell). Emphasis on macro and historical questions.

***242A-242B. Comparative Methods in Historical Sociology** (4,4) II–III. Hawley, Stacey
Seminar—3 hours; term paper. Prerequisite: graduate standing or consent of instructor. Comparative approaches to major historical phenomena such as nationalism, bureaucratization, feudalism, and capitalism; the relevance of psychological and sociological theories to historical interpretation; the verifiability of historically grounded hypothesis; the meaning of analogy, correspondence and causality. (Deferred grading only, pending completion of sequence.) Offered in even-numbered years.

***243. Urban Society** (4) I, L. Lofland
Seminar—3 hours; paper. Broad overview of the issues and concerns of the field of urban sociology. Special emphasis on the human experience of urban living in contemporary, cross-cultural or historical settings.

***245. Developing Societies** (4) II. Dixon
Seminar—3 hours; term paper or project. Prerequisite: graduate student status or familiarity with problems of developing societies. Analysis of social and economic problems of developing societies from the standpoint of theory and research on modernization and underdevelopment. Nature of third world dependency and interdependence in the global political economy. Offered in even-numbered years.

***248. Collective Behavior and Social Movements** (4) II. J. Lofland
Seminar—3 hours; paper. Analysis of current issues in and contributions to the study of collective behavior and social movements; particular focus upon the strategies and tactics of social movements.

***254. Sociological Issues in Health Care** (4) II. 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) II. Lemert
Seminar—4 hours. Prerequisite: consent of instructor. Analysis of the nature of the legal process and its impact on social behavior. Will consider (1) nature and functions of law, (2) the organization and administration of law, and (3) the capacity of law to affect social behavior.

264. Proseminar in Sociology (4) I, Hackett
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) III. Mayhew
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. Dixon
Seminar—4 hours. Prerequisite: course 170 or consent of instructor. How social institutions affect and are affected by the level and variation of mortality, migration, and fertility. Special emphases on the determinants of fertility-related attitudes and behavior, on less-developed countries, and on contemporary empirical studies.

***280. Organizations and Institutions** (4) II. Hackett
Seminar—4 hours. Theory of formal organizations and bureaucracy. Methods of research in organizational and institutional studies. Historical and comparative analysis of political, religious, educational, military and economic structure.

290. Seminar (4) I, II, III. The Staff (Chairperson in charge)
Seminar—3 hours. (S/U grading only.)

292A-292B. Field Research (4-4) II-III. L. Lofland, J. Lofland
Seminar—3 hours; field trips. Prerequisite: graduate standing in Sociology or consent of instructor. The process of collecting, analyzing and reporting qualitative social data: techniques of intensive interviewing, participant-observation and document analysis; generating, developing and evaluating analytic frameworks; recording, storing, retrieving and writing up qualitative data. Emphasis on application

NOTE: For key to footnote symbols, see page 123.

of principles; each participant completes a field work project. (Deferred grading only, pending completion of sequence.) Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Soil and Water Science

(College of Agricultural and Environmental Sciences)

The Major Program

Soil and Water Science is concerned with the use and protection of our land and water resources. The major is designed to provide preparation for a career involving these resources as well as for a more general interest in resource use and protection. Programs are designed to include land use, soil survey, soil management and conservation, plant nutrition, diagnostic technology, irrigation and drainage, water resources management, water quality, general soil science, and general water science. (For example, the emphasis on water quality would include more than the minimum number of units of physical and biological sciences, while an emphasis in resource allocation and land-use planning would include more courses in the social, political, and economic areas.) The flexibility of this major makes possible a wide variety of career opportunities which includes managerial and technical positions with agri-businesses such as equipment and supply companies, farm management, and positions involving advising, planning, land appraisal, research, and teaching with private, district, county, state, federal, and 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* course taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**80–83**
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Mathematics, including calculus, statistics, and computer programming	13
Chemistry, including Chemistry 1A-1B or 4A-4B and a more advanced course	13
Physics (Physics 2A-2B-2C or 8A-8B-8C)	9-12
Geology (Geology 2)	3
Economics or agricultural economics	3
Written expression (see College requirement)	7
Oral expression (see College requirement)	4
Physical sciences, biological sciences and/or mathematics with approval of adviser	18
Depth Subject Matter	**30**
Soil Science 100	4
Water Science 100	4
Additional upper division units in soil science and water science	22
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	**24**
To supplement or expand areas of student interest selected with approval of adviser.	21
Special study or experience (199 or Soil Science 192 in the major area)	3
Unrestricted electives	**21-24**
Total Units for the Major	**180**

† Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Specific Courses of Instruction. For specific courses of instruction in this major, see course listings under Atmospheric Science, Plant Science, Resource Sciences, Soil Science, and Water Science.

Major Adviser. M.J. Singer *(Land, Air and Water Resources).*

Advising Center for the major is located in 122 Hoagland Hall (752-1669).

Graduate Study. Graduate programs are available in Soil Science as well as Water Science. Detailed information can be obtained from the Graduate Adviser and the *Graduate Announcement. See also page 95.*

Related Courses. See courses in Agricultural Economics, Agricultural Science and Management, Agronomy, Botany, Chemistry, Engineering: Agricultural, Engineering: Civil, Environmental Studies, Environmental Toxicology, Geology, International Agricultural Development, Range Science, and Vegetable Crops.

Soil Science

See below, and the Graduate Group (page 310); and also Soil and Water Science

Soil Science

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Land, Air and Water Resources.

Graduate Study. Programs of study leading to the M.S. and Ph.D. degrees in Soil Science are available. Information regarding these programs can be obtained from the graduate adviser and the *Graduate Announcement.*

Graduate Advisers. G.L. Huntington, D.N. Munns, and L.D. Whittig *(Land, Air and Water Resources).*

Courses in Soil Science

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

10. Concepts of Soil Science (3) I, Whittig
Lecture—3 hours; optional Saturday field trip. Not open to students who have received credit for course 100 or similar introductory soil science course. Study of soils as natural bodies formed by interactive environmental processes; their response to use and management; taxonomic and capability classifications; conservation practices for preservation of soil resources. Intended for students with diverse interests and backgrounds.

92. Soil Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in soil science. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Principles of Soil Science (4) II. Munns, Delwiche
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A-1B, Physics 1A-1B, Biological Sciences 1, and consent of instructor; Geology 50, Botany 2, Bacteriology 2, and Chemistry 8 recommended. Formation, properties and behavior of soils. Nature and interactions of solid, aqueous, gaseous and biotic components. Soil-plant-atmosphere relationships. Soil development and geography, management, and conservation.

102. Soil and Water Chemistry (5) II. Burau
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 100 or the equivalent preparation in introductory earth science or consent of instructor. Chemical nature of the mineral and organic constituents of soil and of the soil solution; ion exchange and other colloidal phenomena including the effect of soil amendments and fertilizers; microbiological processes in soils.

105. Field Studies of Soil Resources (8) Extra-session summer. Begg, Huntington, Singer, Southard
On campus—daily 1 week; study tour—daily 5 weeks. Prerequisite: consent of instructor; course 120 recommended. *In situ* soil studies with emphasis on the interactions between soil characteristics and kinds of land use. Field identification and evaluation of soils for agricultural, range, forest, urban, and other uses.

107. Soil Physics (4) I, Rolston
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100, Water Science 100, Mathematics 16A, or the equivalent. Description of soil physical properties. Principles of water, gas, heat, and solute movement in soil with selected examples related to soil and water management. Influence of soil physical properties on transfer processes.

109. Soil Fertility and Fertilizers (4) I, Reisenauer
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or the equivalent preparation in elements of soil science. Forms and availability of plant nutrient elements in soils; effects of fertilizers and soil amendments on crop and soil characteristics; conduct and interpretation of soil fertility assays.

111. Geomicrobiology (4) I. Broadbent
Lecture—3 hours; laboratory—3 hours. Prerequisite: general chemistry and an introductory course in biology. Major groups of microorganisms in the geosphere and their responses to environmental variables. Activities of microorganisms in relation to water pollution, solid waste disposal, pesticide degradation, and soil fertility.

118. Soils in Land Use and the Environment (4) III. Singer
Lecture—3 hours; discussion—1 hour; two 1-day field trips. Prerequisite: course 100 or consent of instructor. Soils are considered as elements in land use planning and environmental quality. Topics include: soil survey reports, remote sensing, land capability classification, soil erosion/conservation, waste disposal on soils and soil reclamation.

120. Soil Genesis and Morphology (2) II. Begg
Lecture—2 hours. Prerequisite: course 100; Geology 1 or 2; or consent of instructor. Soil forming factors and how these factors affect soil properties and soil morphological characteristics. Soil forming processes as they influence the genesis and features of the soil profile. Soil-landform relationships.

120L. Soil Genesis and Morphology Laboratory (1) II. Begg
Laboratory—3 hours (including 4 Saturday field trips). Prerequisite: course 120 (may be taken concurrently). Identification and description of soil morphological characteristics. Use of thin sections and the petrographic microscope to identify micropedological features. Field trips to study soil parent material, soil-climate, soil-vegetation, and soil-landform relationships.

121. Soil Classification and Mapping (3) III. Huntington
Lecture—2 hours; laboratory—3 hours (seven of the ten sessions are in the field). Prerequisite: course 120, 120L; course 118 recommended. Course introduces systems of soil classification to develop broader understanding of soils on the landscape and a basis for soil resource inventory; procedures used in soil survey introduced. Laboratory-field studies provide practice in morphological soil description and soil mapping.

122. Salt-Affected Soils (2) I.
Lecture—2 hours. Prerequisite: course 102 or Water Science 103. Distribution and origin of saline and alkaline soils. Major emphasis placed on their genesis, morphology, and classification as related to chemical, mineralogical, and physical properties. Minor emphasis on reclamation and management. Offered in even-numbered years.

123. Soil Taxonomy (3) II. Huntington
Lecture—14 hours; discussion—14 hours. Prerequisite:

NOTE: For key to footnote symbols, see page 123.

courses 120, 120L and 121, or consent of instructor. An intermediate course in soil classification. Study and analysis of the current system of classification used by the National Cooperative Soil Survey of the United States. Practice in classifying soil individuals with emphasis on evaluating their placement in the system. Offered in even-numbered years.

150. Soil and Plant Tissue Testing (3) III. Rendig, Reisenauer, Carlson (Pomology)
Lecture—3 hours. Prerequisite: course 109, an upper division crop production course, and consent of instructor. Philosophy, conduct, and use of soil and plant tissue analysis in management of soil fertility, in diagnosis of crop nutritional program, and in crop quality assessment.

192. Soil Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in soil science. Internship supervised by a member of the faculty. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Directed group study in soil science for advanced undergraduates. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

207. Transport Processes in Soils (3) II. Rolston, Nielsen
Lecture—3 hours. Prerequisite: Mathematics 22B and course 107. Physical and mathematical description of nonsteady transport processes in soil. Emphasis on water, heat, gas, and solute flow, and the movement and transformation of soluble materials during leaching and irrigation.

208. Soil-Plant Interrelationships (3) II. Rendig
Lecture—3 hours. Prerequisite: course 100; 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) III. 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 odd-numbered years.

215. Physical Chemistry of Soils (3) III. Burau
Lecture—3 hours. Prerequisite: Chemistry 107B or 110B. or consent of instructor. Physicochemical, colloidal, and surface aspects of the soil system. Offered in even-numbered years.

218. Soil Erosion and Conservation (3) III. Singer
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing; courses 118, 120. Processes of soil erosion by wind and water in agricultural areas, and methods of soil conservation will be discussed. Methods of predicting rates of soil erosion will be considered. Offered in even-numbered years.

290. Special Topics in Soil Science (1) I, Läuchli, Munns; III, Singer, Whittig
Seminar—1 hour. Prerequisite: graduate standing. Oral presentation and discussion of scientific material and procedures for review and critique of publications. (S/U grading only.)

291. Current Literature in Plant Nutrition (1) I, II, III. Reisenauer
Seminar—1 hour. Prerequisite: graduate standing in Soil Science, Plant Physiology, Ecology, or related subject, and consent of instructor. The current literature in plant nutrition and soil-plant relationships will be reviewed and discussed. Each participant will prepare and present reports to the seminar. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Soil Science (A Graduate Group)

Delbert W. Henderson, Ph.D., Chairperson of the Group
Group Office, 122 Hoagland Hall (752-0689/1669)

Graduate Study. The Graduate Group in Soil Science offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information regarding the programs, address the chairperson of the group.

Graduate Advisers. Consult the Group Office.

Spanish

(College of Letters and Science)

Robert M Scari, Ph.D., Chairperson of the Department

Department Office (Spanish and Classics), 616 Sproul Hall (752-0835)

Faculty

Marta E. Altisent, Ph.D., Assistant Professor
Samuel G. Armistead, Ph.D., Professor
Donald G. Castanien, Ph.D., Professor Emeritus
Angie C. Chabram, M.A., Acting Assistant Professor
Mariano González, Ph.D., Lecturer
Didier T. Jaén, Ph.D., Professor
Daniel S. Keller, Ph.D., Professor Emeritus
[3,4]Fabián A. Samaniego, M.A., Lecturer
Antonio Sánchez-Romeralo, Ph.D., Professor
Robert M. Scari, Ph.D., Professor
Máximo Torreblanca, Ph.D., Professor
Hugo J. Verani, Ph.D., Professor

Faculty

José daCruz, Licenciate, Visiting Lecturer *(Portuguese)*

The Major Program

The major in Spanish is designed to develop competence in the spoken and written language and to provide the possibility of emphasis either on language or on literature, depending upon each student's professional goal. The program, alone or in combination with other major programs, may lead to advanced study of the language or literatures of Spain and Spanish America, and to careers not only in teaching but also in other professions such as library science, law, medicine, and in government, social service, or business. Spanish majors are strongly encouraged to complement their work in the department through studies in related areas such as Mexican-American studies, international relations, linguistics, comparative literature, art, history, and philosophy.

Spanish

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**0-33**
Spanish 1 or 1AT, 2 or 2AT, 3 or 3AT, 4 or 7A, 5 and 6 or 7B, 28 or 7C (or the equivalent)	0-33
Depth Subject Matter	**39**
Spanish 100	3
Spanish 103A-103B	8
Spanish 110A or 110B	4
Spanish 131	4
Spanish 134, 135, or 136	4
Additional upper division units	16
To be selected in consultation with a major adviser. These units may be concentrated in a single area such as Spanish language, Spanish literature, or Spanish-American literature, or selected from two or more areas. See recommendations below.	
Total Units for the Major	**39-72**

Recommended
The following recommendations should be taken into account. Majors who are interested in a concentration in:

(a) language are advised to take Linguistics 1 (not counted toward major). This course is prerequisite to Linguistics 115 (Chicano sociolinguistics) and 150 (contrastive analysis of Spanish) which may be counted toward the 16 additional upper division units.

(b) a teaching career are advised to take Spanish 300 (the teaching of Spanish).

(c) graduate work in Spanish are advised to take Latin 10 or the equivalent.

Major Advisers. M. González, M. Torreblanca, H.J. Verani.

Minor Program Requirements:

	UNITS
Spanish	**22-24**
One course in Spanish literature (any course)	4
One course in culture from Spanish 134, 135, 136	4
One course in advanced composition from Spanish 110A, 110B	4
One course from Spanish 131, 132, or 133	3-4
Two elective courses acceptable for the Spanish major chosen in consultation with a major adviser	7-8

Note: Students majoring in Linguistics or Mexican-American (Chicano) Studies and minoring in Spanish should bear in mind that if Spanish courses are used to satisfy the major requirements, only one of these courses may be applied to the minor.

Teaching Credential Subject Representative. M. González. See page 98 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.T. Jaén (M.A. degrees); A. Sáchez-Romeralo (Ph.D. degrees).

Courses in Portuguese

Lower Division Courses

1. Elementary Portuguese (5) I. The Staff
Discussion—1 hour; laboratory—1 hour; recitation—3 hours. Portuguese grammar, conversation, and reading. (Students who have successfully completed, with a C– or better, Portuguese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grading will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Portuguese (5) II. daCruz
Discussion—1 hour; laboratory—1 hour; recitation—3 hours. Prerequisite: course 1 or consent of instructor. Continuation of course 1.

NOTE: For key to footnote symbols, see page 123.

3. Elementary Portuguese (5) III. daCruz
Discussion—1 hour; laboratory—1 hour; recitation—3 hours. Prerequisite: course 2 or consent of instructor. 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 4-hour sessions; recitation—5 hours. An introduction to the fundamentals of Spanish grammar. Listening and speaking emphasized. (Students who have successfully completed, with a C− or better, Spanish 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1ATA-1ATB-1ATC. Individualized Instruction in Elementary Spanish (2-2-2) I-II-III. (Samaniego in charge)
The three segments of course 1AT correspond to course 1. Student-instructor contacts consisting of individual tutoring conversation practice and testing periods. Students may start at any point and complete one or more two-unit segments in a given quarter. (Students who have successfully completed, with a C− or better, Spanish 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Spanish (6) I, II, III. The Staff (Samaniego in charge)
Laboratory—two 4-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 in charge)
Prerequisite: course 1 or 1ATA-1ATB-1ATC. The three segments of course 2AT correspond to course 2. Student-instructor contacts consisting of individual tutoring, conversation practice and testing periods. Students may start at any point and complete one or more two-unit segments in a given quarter.

3. Intermediate Spanish (6) I, II, III. The Staff (Samaniego in charge)
Laboratory—1 hour; recitation—5 hours. Prerequisite: course 2 or 2AT. Conversational practice based on everyday vocabulary of modern spoken Spanish. Review of grammatical principles and expansion of vocabulary through readings of modern texts.

3ATA-3ATB-3ATC. Individualized Instruction in Spanish (2-2-2) I-II-III. (Samaniego in charge)
Autotutorial. Prerequisite: course 2 or 2ATA-2ATB-2ATC. Continuation of course 2ATA-2ATB-2ATC.

4. Intermediate Spanish (5) I, II, III. The Staff (González in charge)
Discussion—1 hour; recitation—4 hours. Prerequisite: course 3. Grammar review through oral and written exercises, and expansion of vocabulary through reading of modern texts.

5. Intermediate Spanish (3) I, III, III. The Staff
Recitation—3 hours. Prerequisite: course 4. Continuation of course 4.

6. Introduction to Reading (3) I, II, III. The Staff
Recitation—3 hours. Prerequisite: course 4; course 28 (may be taken concurrently) recommended. Reading of selected Spanish texts to acquaint students with a variety of written styles. Exercises and tests will emphasize comprehension and will focus on particular problems of grammar and vocabulary.

7A-7B-7C. Grammar and Composition for Native Speakers (4-4-4) I-II-III.
Discussion—3 hours; compositions. Prerequisite: course 3 or the equivalent, or consent of instructor. Grammar and composition. Open to students whose native language is Spanish or to those who are bilingual though cannot be given to graduates of high schools where Spanish was the language of instruction. Open to majors and non-majors.

8A. Elementary Spanish Conversation (2) I, II, III. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 3; course 4 (concurrently) recommended. Directed group conversation including practical exercises in phonetics and language pronunciation. Vocabulary expansion and emphasis on grammatical accuracy. Limited enrollment. (P/NP grading only.)

8B. Elementary Spanish Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 4 or 8A; course 5 (concurrently) recommended. Continuation of course 8A. Limited enrollment. (P/NP grading only.)

9. Intermediate Spanish Conversation (2) I, II, III. The Staff (Chairperson in charge)
Discussion—2 hours. Prerequisite: course 5 or 8B; course 28 (concurrently) recommended. Directed group conversation with special emphasis on development of fluency in oral expression for the more advanced student. Limited enrollment. (P/NP grading only.)

28. Spanish Composition (4) I, II, III. The Staff
Discussion—3 hours; written assignments. Prerequisite: course 5; course 6 (may be taken concurrently) recommended. Development of writing skills through correct use of idiomatic expressions, practice in writing summaries and original compositions.

34. Mexico in Its Literature (3) II.
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.
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.

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

Course 100 is prerequisite to all upper division literature courses.

100. Introduction to Principles of Criticism (3) I, II, III. Verani in charge
Lecture—3 hours. Prerequisite: course 28 or 7C. Designed to provide students with the skills to recognize the basic principles involved in literary criticism and a useful terminology to analyze the different genres of Hispanic literature.

103A. Hispanic Literature I: Medieval and Golden Age (4) I, II, III. The Staff
Lecture—3 hours; written reports. Prerequisite: course 100. Introduction to the study of the principal authors, works, and movements of Medieval and Golden Age literature of Spain, and of Spanish-American colonial literature.

103B. Hispanic Literature I: Medieval and Golden Age (4) I, II, III. The Staff
Lecture—3 hours; written reports. Prerequisite: course 100. Introduction to the study of the principal authors, works, and movements of Medieval and Golden Age literature of Spain, and Spanish-American colonial literature.

104A. Hispanic Literature II: Modern Peninsular (4) I. The Staff
Lecture—3 hours; written reports. Prerequisite: course 100. Introduction to the study of the principal authors, works, and movements of modern Spanish literature from 1700 to the present. Offered once every 4 quarters (next, Fall 1985).

104B. Hispanic Literature II: Modern Peninsular (4) I. The Staff
Lecture—3 hours; written reports. Prerequisite: course 100. Introduction to the study of the principal authors, works, and movements of modern Spanish literature from 1700 to the present. Offered once every 4 quarters (next, Fall 1984).

105A. Hispanic Literature III: Modern Spanish American (4) II. The Staff
Lecture—3 hours; written reports. Prerequisite: course 100. Introduction to the principal authors, works, and movements of Spanish-American literature of the nineteenth and twentieth centuries. Offered once every 4 quarters (next, Winter 1985).

105B. Hispanic Literature III: Modern Spanish American (4) III. The Staff
Lecture—3 hours; written reports. Prerequisite: course 100 Introduction to the principal authors, works, and movements of Spanish-American literature of the nineteenth and twentieth centuries. Continuation of course 105A. Offered once every 4 quarters (next, Spring 1985).

108A. Spanish-American Prose of the Twentieth Century (4) III. Verani
Lecture—3 hours; conferences and reports. Prerequisite: course 100. Emphasis on the development of the novel. Offered in odd-numbered years.

108B. Spanish-American Prose of the Twentieth Century (4) III. Veroni
Lecture—3 hours; conferences and reports. Prerequisite: course 100. 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 100. Offered in even-numbered years.

110A. Advanced Spanish Composition I (4) I. The Staff
Discussion—3 hours; written reports. Prerequisite: course 28 or 7C. Practice in expository writing, with an aim toward refinement and expansion of vocabulary.

110B. Advanced Spanish Composition II (4) II. The Staff
Discussion—3 hours; written reports. Prerequisite: course 28 or 7C. Practice in creative writing, with an aim toward refinement and appreciation of written expression and expansion of vocabulary.

111. Don Quijote (4) II. The Staff
Lecture—3 hours; written reports. Prerequisite: Spanish 100.

112. Medieval Masterworks (4) I, Armistead
Lecture—3 hours; term paper. Prerequisite: course 100. Study of major works of Medieval Spanish literature from its origins up to the fifteenth century. Offered in odd-numbered years.

114. Spanish Romantic Literature (4) II. Scari
Lecture—3 hours; conferences and reports. Prerequisite: course 100. 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; term paper. Prerequisite: Spanish 100. Offered in odd-numbered years.

119. Spanish Novel of the Nineteenth Century (4) III. Scari
Lecture—3 hours. Prerequisite: course 100. Offered in odd-numbered years.

120A. Twentieth-Century Spanish Prose (4) I. The Staff
Lecture—3 hours; term paper. Prerequisite: course100.

120B. Twentieth-Century Spanish Drama (40 III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 100. Offered in odd-numbered years.

120C. Twentieth-Century Spanish Poetry (4) III. Sánchez-Romeralo
Lecture—3 hours; term paper. Prerequisite: course 100. Offered in even-numbered years.

124. Chicano Culture (4) I.
Lecture—3 hours; term paper. Prerequisite: course 2 or consent of instructor. Study of Chicano culture in the Southwest from 1598 to the present, emphasis on the period after 1848. Lectures and discussions in English; readings in English and/or Spanish. May not be counted as part of major in Spanish. Offered in odd-numbered years.

125. Spanish-American Modernism (4) II. Verani
Lecture—3 hours; term paper. Prerequisite: course 100. Study of the poetry and prose of Spanish-American Modernismo (1880 to 1916). Offered in even-numbered years.

126. Chicano Literature (4) I. The Staff
Lecture—3 hours; term paper. Prerequisite: course 2 or consent of instructor. Analysis and interpretation of representative works in poetry, prose fiction, essay and drama. Lectures and discussion in English. Readings in English and/or Spanish. May not be counted as part of the major in Spanish. Offered in even-numbered years.

127. Contemporary Spanish-American Poetry (4) III. Verani
Lecture—3 hours; term paper. Prerequisite: course 100. Development of Spanish-American poetry from the end of Modernism to the present. Emphasis on works of Huidobro, Neruda, Vallejo, Borges and Octavio Paz. Offered in even-numbered years.

128. Contemporary Spanish-American Short Story (4) II. Jaén
Lecture—3 hours; term paper. Prerequisite: course 100. 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. Chabram
Lecture—3 hours; term paper. Prerequisite: course 100 or consent of instructor. Major figures in the development of the Mexican novel. Offered in odd-numbered years.

131. Modern Spanish Syntax (4) I.
Lecture—3 hours; conferences and reports. Prerequisite: course 28 or 7C or consent of instructor. Study of word relationships in European and American Spanish, with special attention to syntax of verbs.

NOTE: For key to footnote symbols, see page 123.

132. Introduction to Spanish Linguistics (3) III. Torreblanca
Lecture—3 hours. Prerequisite: course 28 or 7C or consent of instructor. Priniciples of classical phonemics and morphemics together with more recent developments; descriptive analysis of modern Spanish sounds and forms. Theoretical and practical comparison with English and other Romance Languages.

133. Spanish Phonetics (3) I, II. Torreblanca
Lecture—3 hours. Prerequisite: course 28 or 7C or consent of instructor. The sound structure of modern Spanish; theoretical analysis of selected problems in pronunciation. Strongly recommended for prospective teachers.

134. Survey of Spanish Culture (4) I, González
Lecture—3 hours; paper. Prerequisite: course 28 or 7C or consent of instructor. Offered in even-numbered years.

135. Survey of Mexican Culture (4) II.
Lecture—3 hours; paper. Prerequisite: course 28 or 7C or consent of instructor. (Offered in odd-numbered years.)

136. Survey of Spanish-American Culture (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; term paper. Prerequisite: course 28 or 7C. Major developments in the arts and social institutions of Spanish-American areas other than Mexico. Readings, lectures and discussions in Spanish.

137. Contrastive Spanish-English Morphosyntax (4) II. The Staff (Torreblanca in charge)
Lecture—3 hours; individual and group conferences; term paper. Prerequisite: course 28 or the equivalent; Linguistics 1 or 150 recommended or consent of instructor. Contrastive grammatical analysis of English and Spanish, error analysis, introduction to methods and concepts of structuralist and transformational linguistics, the basic elements of morphology, constituent elements of the noun and verb phrases.

138. Contemporary Spanish-American Drama (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: course 100. Study of major authors, significant trends, as well as origins and development of the genre.

149. Latin-American Literature in Translation (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: course 100. Reading, lectures, and discussion in English of works by Neruda, Vallejo, Borges, García Márquez, Paz, and others. May not be counted toward major in Spanish. Offered in odd-numbered years.

150. Masterpieces of Spanish Literature (4) I, Scari
Lecture—3 hours; paper. 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; term paper. Prerequisite: course 100. May be repeated for credit with consent of instructor.

192I. Internship in Spanish (1-4) I, II, III. The Staff (Chairperson in charge)
Field work. Prerequisite: course 28 or 7C; junior standing; major in Spanish, Mexican-American (Chicano) studies, or a related field. Internships in fields where Spanish language skills can be used and perfected (teaching, counseling, translating-interpreting, etc.). May be repeated for credit for a total of 8 units. Units will not count toward the Spanish major. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Techniques of Literary Scholarship (4) III. Armistead
Seminar—3 hours. Elements of bibliography and fundamental methods of literary research. (S/U grading only.)

209. Literary Theory and Criticism: Prose Fiction (4) III. Verani
Seminar—3 hours. Study of contemporary literary theories and their application to twentieth-century Spanish American prose fiction.

210. Literary Criticism: Poetry (4) I.
Seminar—3 hours. Offered in odd-numbered years.

220A. History of the Spanish Language (4) I, Torreblanca
Seminar—3 hours. Prerequisite: Latin 1.

220B. History of the Spanish Language (4) II. Torreblanca
Seminar—3 hours. Prerequisite. Latin 1.

221. Hispanic Dialectology (4) III. Torreblanca
Seminar—3 hours. Prerequisite: course 220A or consent of instructor. Descriptive and historical study of the distinctive features of Peninsular and American Spanish dialects.

225A. Masterworks of Medieval Spanish Literature (4) I, Armistead
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of early Medieval Spanish literature: epic poetry, clerical poetry and the origins of castilian prose. Offered in even-numbered years.

225B. Masterworks of Medieval Spanish Literature (4) II. Armistead
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of late Medieval prose works: didactic prose; sentimental and chivalric novel; *La Celestina*. Offered in even-numbered years.

225C. Medieval Spanish Epic (4) III. Armistead
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of major works of Medieval Castilian heroic poetry from its origins through the decadence of the genre in the fifteenth century. Offered in odd-numbered years.

225D. Medieval Lyric (4) I, Armistead
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of representative early lyric poetry in the various peninsular languages. Offered in odd-numbered years.

226. El libro de buen amor (4) II. Armistead
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of the fourteenth-century didactic poem, *El libro de buen amor* (The Book of Good Love) by Juan Ruiz, Archpriest of Hita. Offered in odd-numbered years.

227. El Romancero (4) III. Armistead
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of Hispanic ballad literature from the fifteenth century to the present. Offered in odd-numbered years.

228. Folkliterature of the Hispanic World (4) I, Armistead
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of the various genres of oral traditional literature among the Hispanic peoples. Offered in even-numbered years.

229. Spanish Literature of the Early Renaissance (4) I, Armistead
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: Literature of Ideas (4) II. The Staff
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Offered in odd-numbered years.

231D. Spanish Literature of the Golden Age: Narrative (4) II. The Staff
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. 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.
Seminar—3 hours. 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
Seminar—3 hours. Offered in odd-numbered years.

235B. Twentieth-Century Spanish Prose (4) II
Seminar—3 hours. Offered in even-numbered years.

236. Twentieth-Century Spanish Thinkers (4) III. Scari
Seminar—3 hours. Major thinkers from Ganivet to Unamuno and Ortega y Gasset. Emphasis will be placed on the relationships between Spanish thought and European philosophical currents. Offered in even-numbered years.

237. Twentieth-Century Spanish Drama (4) I.
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. Galdós and Spanish Realism (4) II Scari
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Offered in even-numbered years.

240. Twentieth-Century Spanish-American Drama (4) III.
Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. Major Spanish-American dramatists from Florencio Sanchez to the present. Offered in even-numbered years.

241A. Spanish-American Novel, 1900-1950 (4) I, Verani
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of main trends and key authors in Spanish-America in the first half of the twentieth century. Offered in even-numbered years.

241B. New Trends in Spanish-American Fiction (4) II. Verani
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Recent development in Spanish-American narrative. Emphasis on innovative language and structure. Offered in even-numbered years.

242. The Mexican Novel (4) III. Jaén
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Emphasis on twentieth-century Mexican novel from Azuela, Yañez, Rulfo, Fuentes to the present. 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, Garcia Márquez, Cortázar, and Rulfo.

245. Dario and Modernism (4) I, Verani
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of poetry and prose of Spanish-American Modernismo (1880 to 1916). Offered in odd-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. Jáen
Seminar—3 hours. Major Spanish-American essayists from Sarmiento to Octavio Paz. Offered in odd-numbered years.

251. Studies on a Major Writer, Period, or Genre (4) III. The Staff
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Artistic development of a major writer and his intellectual and literary milieu or study of a special topic, period or genre. May be repeated for credit with consent of instructor.

299. Research (2-5) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Professional Courses

300. The Teaching of Spanish (3) III. Samaniego
Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in Spanish.

390A. Problems in Teaching Spanish at College Level (3) I, Samaniego
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing. Theoretical instruction in modern teaching methods and demonstration of their practical application. Required of graduate teaching assistants.

390B. Problems in Teaching Spanish at College Level (1) III. Samaniego
Discussion—1 hour. Prerequisite: graduate standing. Theoretical instruction in modern teaching methods and demonstration of their practical application. Intended primarily for graduate teaching assistants.

Statistics

(Intercollege Division)

Robert H. Shumway, Ph.D., Acting Chairperson of the Division and Associate Dean of Statistics

Division Office, 469 Kerr Hall (752-2361)

Faculty

P.K. Bhattacharya, Ph.D., Professor
Alan P. Fenech, Ph.D., Associate Professor
Charles E. Franti, Ph.D., Professor *(Statistics, Community Health)*
Wesley O. Johnson, Ph.D., Assistant Professor
Y.P. Mack, Ph.D., Associate Professor
Norman S. Matloff, Ph.D., Associate Professor *(Statistics, Electrical and Computer Engineering)*
Francisco J. Samaniego, Ph.D., Professor
Robert H. Shumway, Ph.D., Professor
Jessica M. Utts, Ph.D., Associate Professor
Jane-Ling Wang, Ph.D., Assistant Professor

NOTE: For key to footnote symbols, see page 123.

Alvin D. Wiggins, Ph.D., Professor
Neil H. Willits, Ph.D., Assistant Professor

Statistics is a subject which touches our lives virtually every day in a variety of ways, from the amount we pay for insurance to the television shows which are left on the air. It has been developed to enable us to make inferences about entire populations, based on samples extracted from those populations. Thus, statistical methods can be applied to problems from almost every discipline and they are vitally important to researchers in agricultural, social, engineering, and medical sciences.

The Division of Statistics offers courses to fulfill needs at all levels. A minor in statistics gives the student a basic grounding in both theory and applications and would be a valuable complement to almost any major program. An undergraduate major in statistics is sufficient preparation for either a career or graduate study in the field.

Entry-level courses for students are as follows:

(a) Statistics 13, 32, and 102. These three courses are essentially equivalent in content, each designed as an introduction to the basic concepts and methods of probability and statistics. However, they differ from one another in the background expected of the student. Courses 13 and 102 require only high school algebra, although 102 is taught at a faster pace and covers somewhat more material. Course 32 is recommended as an alternative for students who have some background in computer programming and calculus; here students complement the analytical side of the lecture material by writing simulation programs which develop valuable intuitive insight.

(b) Statistics 130A-130B and 131A-131B-131C. These courses require calculus, and present both the methods of statistics and the probabilistic backgound from which the methods are derived. The two sequences cover the same material, but the 131 course sequence goes into more depth. Neither sequence, course 130 or 131, requires a prerequisite from the set, courses 13, 32, and 102, discussed above, but students often find such a background helpful.

The Major Programs

Probability models and statistical methods are used in a great many fields, including the biological and social sciences, business and engineering. The wide applicability of statistics has created in both the public and private sectors a strong demand for graduates with statistical training. The Bureau of Labor Statistics has estimated that the demand for trained statisticians in government and industry will exceed the supply by at least 1,500 through the year 1985. Current employment opportunities include state and federal government positions with a statistician designation, industrial positions (e.g., in the actuarial series within an insurance company or in the data management unit in a health science facility), and teaching positions.

The major programs in statistics are designed to make possible a wide variety of career choices. The Bachelor of Arts degree is very flexible, facilitating a double major or extensive elective course work in a field in which statistics is applied. The Bachelor of Science degree program has two options: one emphasizes mathematics and is especially recommended as preparation for graduate study in statistics; the other emphasizes computer science. All three programs require theoretical and applied coursework and emphasize the strong interdependence of statistical theory and the applications of statistics.

The concurrent study of statistics and a field of applications at an advanced level will serve students well either in preparing for a career in an area of application or in preparing for graduate study. Students with a strong interest in a quantitative discipline are encouraged to pursue a double major combining statistics and this discipline.

Statistics and Computer Science. These two fields interact in many ways, with each discipline having applicatons to the other. Applied statistical work relies on computer science areas such as database management, numerical analysis, algorithm optimization and graphics, while computer science uses statistics in areas such as pattern recognition, evaluation of operating systems and simulation. Thus advanced courses in computer science are recommended for all students in statistics. In particular the degree program, Statistics—Computer Science, is designed as an integrated package combining statistics and computer science.

Students interested in one of the following major programs in Statistics are invited to meet with an undergraduate adviser for further information about planning a program.

Preparatory Requirements. Before applying for either the A.B. or B.S. major in Statistics, students must ordinarily complete the following courses with at least C grades:

Mathematics 21A, 21B, 21C

Mathematics 22A, 22B

Computer Science Engineering 8 or Engineering 5

Statistics 32

In addition, due to space limitation in the B.S. major, students admitted to this major will normally be chosen from those having at least a 3.0 grade-point average in the above courses. For further information, please contact a Statistics adviser.

Statistics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**24**
Calculus, Mathematics 21A, 21B, 21C	12
Linear algebra, differential equations, Mathematics 22A, 22B	6
Computer science, Computer Science Engineering 8 or Engineering 5 (or the equivalent)	3
Statistics through computers, Statistics 32	3
Depth Subject Matter	**36-37**
Analysis of variance, multiple regression, Statistics 106, 108 or the equivalent	7
Probability and mathematical statistics, Statistics 131A, 131B, 131C	12
Three Statistics courses with Statistics 131 as a prerequisite	8-9
Related elective courses	9
Three upper division courses approved by major adviser. They may be in mathematics, computer science or in quantitative aspects of a substantive discipline.	
Total Units for the Major	**60-61**

Statistics

B.S. Major Requirements:

(Options: Statistics—general; Statistics—Computer Science)

	UNITS
Preparatory Subject Matter	**24-27**
Calculus, Mathematics, 21A, 21B, 21C	12
Linear algebra; differential equations, Mathematics 22A, 22B	6
Computer science:	
General option	9
Computer Science Engineering 8 or Engineering 5 (or the equivalent)	
Computer Science option	6
Computer Science Engineering 8 and 80	
Statistics through computers, Statistics 32	3

Statistics (general) option

Depth Subject Matter	**48-52**
Analysis of variance, multiple regression, Statistics 106, 108 or the equivalent	7
Introduction to probability, mathematical statistics, Statistics 131A, 131B, 131C or the equivalent	12
Four Statistics courses having Statistics 131 as a prerequisite	11-12
Linear algebra, Mathematics 167	3
Three upper division Mathematics courses selected from 108, 127A-127B-127C, 128A-128B-128C, 168. (Mathematics 127 strongly recommended for students considering graduate work in Mathematics or Statistics.)	9-12
Related elective courses	6
Two upper division courses approved by major adviser. These may be in mathematics, computer science or in quantitative aspects of a substantive discipline.	
Total Units for the Major (General option)	**72-79**

Computer Science option

Depth Subject Matter	**53-54**
Analysis of variance, multiple regression, Statistics 106, 108 (or the equivalent)	7
Introduction to probability, mathematical statistics, Statistics 131A, 131B, 131C	12
Two courses having Statistics 131 as a prerequisite	6
Statistical computing, Statistics 141	3
Discrete event simulation, Electrical and Computer Engineering 186	3
Data structures, Computer Science Engineering 8	3
Computer structure and assembly language, Electrical and Computer Engineering 170	4
File systems, Electrical and Computer Engineering 185	4
Numerical analysis, Mathematics 128A, 128B	8
One course from Computer Science Engineering 123, Electrical and Computer Engineering 181, 182A	3-4
Total Units for the Major (Computer Science option)	**77-81**

Major Advisers. A.P. Fenech, N.S. Matloff.

Sometime before or during the first quarter of the junior year students planning to major in statistics should consult with a faculty adviser to plan the remainder of their undergraduate programs. Students are encouraged to meet with an adviser to plan a program as early as possible.

Minor Program Requirements:

The Division offers a minor program in Statistics that consists of a survey at the upper division level of the fundamentals of mathematical statistics and of the most widely used applied statistical methods.

	UNITS
Statistics	**18**
Statistics 106, 108, and 130A-130B or 131A-131B	15
One course in Statistics having Statistics 130B or 131B as a prerequisite	3

Preparation: Statistics 13 or 32.

Graduate Study. The Graduate Group in Statistics offers study and research leading to the M.S. and Ph.D. degrees in Statistics. Detailed information concerning these degree programs, as well as information on admissions and on financial support, is available from the Division of Statistics.

Graduate Advisers. P. K. Bhattacharya, Y.P. Mack.

Statistical Consulting. The Division provides a consulting service for researchers on campus. For more information, call the Statistical Laboratory Office (2-6096) or the Division Office (2-2361).

Courses in Statistics

Lower Division Courses

12. Introduction to Discrete Probability (3) I. The Staff Lecture—3 hours. Prerequisite: two years of high school algebra. Random experiments; countable sample spaces; elementary probability axioms; counting formulas; conditional probability; independence; Bayes theorem; expectation;

NOTE: For key to footnote symbols, see page 123.

gambling problems; binomial, hypergeometric, Poisson, geometric, negative binomial and multinomial models; limiting distributions; Markov chains. Applications in the social, biological and engineering sciences. Offered in even-numbered years.

13. Elementary Statistics (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: two years of high school algebra. Measures of central tendency and dispersion; binomial, normal, Student-t, and chi-square distributions; testing hypotheses; nonparametric statistics; regression and correlation theory. (Students having had courses 130A or 131A may not receive credit for Statistics 13.)

32. Basic Statistical Analysis Through Computers (3) II. The Staff
Lecture—3 hours. Prerequisite: Mathematics 16B or 21B; Computer Science Engineering 8, 20, or Engineering 5. Introduction to modern statistical thinking using student-developed digital computer algorithms. Simulation and approximation methods. Sampling. Robust estimation and hypothesis testing. Association methods: regression, correlation, and contingency tables.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Special topics in statistics appropriate for study at the lower division level. (P/NP grading only.)

Upper Division Courses

102. Introduction to Probability Modeling and Statistical Inference (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: two years high school algebra, and upper division standing. Introductory probability and statistics at a rigorous yet precalculus level. Topics include: probability models—binomial, Poisson, geometric; normal and sampling distributions; graphics; exploratory data analysis; parametric and nonparametric estimation and testing; analysis of variance; regression; computing with Minitab package. Students who have had course 13 may receive only 2 units of credit for course 102.

103. Applied Statistics for Business and Economics (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 13 or 32 or 102. Descriptive statistics: probability; random variables; expectation; binomial, normal, Poisson, other univariate distributions; joint distributions; sampling distributions, central limit theorem; properties of estimators; linear combinations of random variables; testing and estimation; Minitab computing package.

104. Applied Statistical Methods: Nonparametric Statistics (3) II. The Staff
Lecture—3 hours. Prerequisite: course 13, 32, or 102. Sign and Wilcoxon tests, Walsh averages. Two-sample procedures. Inferences concerning scale. Kruskal-Wallis test. Measures of association. Chi square and Kolmogorov-Smirnov tests. Offered in even numbered years.

106. Applied Statistical Methods: Analysis of Variance (4) I, II, III. The Staff
Lecture—4 hours. Prerequisite: course 13, 32, or 102. One-way and two-way fixed effects analysis of variance models. Randomized complete and incomplete block design, Latin squares. Multiple comparisons procedures. One-way random effects model.

108. Applied Statistical Methods: Regression Analysis (3) I, III. The Staff
Lecture—3 hours. Prerequisite: course 13, 32, or 102. Simple linear regression, multiple regression, variable selection techniques, stepwise regression, analysis of covariance.

110. Applied Statistical Methods: Multivariate Analysis (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 13, 32, or 102, and 106 or 108. Estimation of the mean vector and covariance matrix of a multivariate population. Multiple comparisons methods. Estimation of simple, multiple and partial correlation coefficients. One-way MANOVA. Linear discriminant functions. Principal component analysis. Factor analysis. Offered in odd-numbered years.

130A-130B. Mathematical Statistics, Brief Course (4-4) I-II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16B. Course in mathematical statistics for nonmajors. Concepts of probability and sampling, principles of estimation, properties of estimators, sampling distributions, bivariate normal and principles of testing.

131A. Introduction to Probability Theory (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A. Fundamental concepts of probability theory, discrete and continuous random variables, standard distributions, moments and moment-generating functions, laws of large numbers and the central limit theorem. Students who have had Mathematics 131 may not receive credit for Statistics 131A.

131B-131C. Introduction to Mathematical Statistics (4-4) II-III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 131A or Mathematics 131. Sampling, point estimation, exact sampling distribution, confidence intervals, hypothesis testing, linear regression and analysis of variance.

134. Nonparametric Inference (3) II. The Staff
Lecture—3 hours. Prerequisite: course 130B or 131B. Selected topics in nonparametric statistical inference from a one-sample and a k-sample point of view. Topics include Kolmogorov-Smirnov type tests; confidence intervals for quantiles, location and scale parameters; rank tests, dispersion tests, efficiency. Offered in odd-numbered years.

135. Multivariate Data Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: course 130B or 131B. Quantitative description and analysis of social and biological problems. Multivariate statistical procedures implemented through computer methods. Applied time series, factor and cluster analysis.

137. Applied Time Series Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: course 130B or 131B or the equivalent. Auto- and cross-correlation, spectral analysis, coherence, transfer relations, linear filters, seasonal adjustment, mean square regression, autoregressive moving average models, forecasting, Box-Jenkins methods, spectral analysis of variance, and signal detection and discrimination methods.

138. Analysis of Categorical Data (3) I. The Staff
Lecture—3 hours. Prerequisite: course 130B or 131B, or courses 106 and 108. Varieties of categorical data, cross-classifications; contingency tables, tests for independence. Multidimensional tables and log-linear models, maximum likelihood estimation; tests of goodness of fit. Logit models, linear logistic models. Analysis of incomplete tables. Marginal homogeneity and symmetry in square tables.

141. Statistical Computing (3) II. The Staff
Lecture—3 hours. Prerequisite: course 130A or 131A or the equivalent; one course from Computer Science Engineering 8 or Engineering 5; knowledge of regression analysis and matrix algebra. Computational aspects of linear models and nonlinear models; development of packaged statistical programs; simulation techniques; graphics.

142. Reliability (3) III. The Staff
Lecture—3 hours. Prerequisite: course 130B or 131B or consent of instructor. Stochastic modeling and inference for reliability systems. Topics include: coherent systems, statistical failure models, notions of aging, maintenance policies and their optimization. Offered in odd-numbered years.

144. Sampling Theory of Surveys (3) II. The Staff
Lecture—3 hours. Prerequisite: course 130B or 131B. Description and analysis of sample surveys with applications in the social and biological sciences. Stratified and cluster sampling. Ratio estimation. Problem of nonresponse. Offered in even-numbered years.

192. Internship in Statistics (1-12) I, II, III.The Staff (Chairperson in charge)
Internship—3-36 hours; term paper. Prerequisite: upper division standing and consent of instructor. Work experience in statistics. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Special topics in statistics appropriate for study at the upper division level. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Special topics in statistics appropriate for study at the upper division level. (P/NP grading only.)

Graduate Courses

205. Statistical Methods for Research (3) III. The Staff
Lecture—3 hours. Prerequisite: course 106 or the equivalent. Topics in experimental design include: Latin squares, Youden squares, balanced and partially balanced incomplete block designs, factorial experiments, confounded designs, split-plot designs, lattice designs, fractional factorial designs, repeated measurements designs, optimal designs based on various criteria, analysis of covariance.

221. Biostatistics: Risk Analysis (3) II. The Staff
Lecture—3 hours. Prerequisite: courses 131A and 131B; consent of instructor. Modern methodologies for scientific inference in bioassay and medical trials; low-dose extrapolation problems; retrospective studies; standardization of rates; clinical trials; cohort life tables.

222. Biostatistics: Applied Stochastic Processes and Survival Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 131A and 131B, and consent of instructor; Mathematics 132A recommended. Brief review of Markov models and generating functions; epidemic models; spatial processes; Chapman-Kolmogorov equation; general illness-death (Fix-Neyman) model, failure-time models; survival analysis; covariate adjustment in survival studies; survival analysis with incomplete data.

230. Brief Advanced Mathematical Statistics (3) I. The Staff
Lecture—3 hours. Prerequisite: course 131A, 131B-131C, or Mathematics 167 or the equivalent. Distribution theory, modes of convergence, laws of large numbers, central limit theorem, Slutsky's Theorem, δ-method, consistency and asymptotic normality of maximum likelihood estimates, method of scoring, hypothesis testing based on likelihood ratios, Pitman efficiency, concepts of decision theory, Bayesian inference. Students who have received credit for courses 231A, 231B, or 231C may receive only 2 units, 1 unit, or no credit respectively for course 230.

231A-231B-231C. Mathematical Statistics (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 131C. Distribution theory, decision theoretic methods, estimation and hypothesis testing, multivariate techniques, large sample theory.

232A-232B. Linear Model Theory (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: course 131C. Estimation and testing for the general linear hypothesis, components of variance, multiple comparisons.

232C. Advanced Regression Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 108 and 131C or 130B, or consent of instructor. Techniques of variable selection; problems of multicollinearity; nonlinear regression. Special topics.

233. Design of Experiments (3) III. The Staff
Lecture—3 hours. Prerequisite: course 131C. Topics from balanced and partially balanced incomplete block designs, fractional factorials, and response surfaces. Offered in odd-numbered years.

236A. Advanced Mathematical Statistics: Sequential Analysis (3) II. The Staff
Lecture—3 hours. Prerequisite: course 231C. Sequential decision functions, Bayes and minimax rules, backward induction, sufficiency and invariance under sequential sampling, Wald SPRT and its optimality, continuouis time SPRT, repeated significance tests, confidence intervals. Offered in odd-numbered years.

236B. Advanced Mathematical Statistics: Nonparametric Theory (3) III. The Staff
Lecture—3 hours. Prerequisite: courses 134 and 231C. Locally most powerful rank tests, asymptotic distribution theory under null hypothesis and under local alternatives, empirical process, Kolmogorov-Smirnov and Cramér-von Mises tests, representation of sample quantities, nonparametric density estimation and nonparametric regression. Offered in even-numbered years.

237A. Time Series Analysis: Foundations (3) I. The Staff
Lecture—3 hours. Prerequisite: course 131A or Mathematics 131 or the equivalent. Basic structure of stationary and non-stationary time series. Differentiation, integration, spectral representations, linear filtering, mean square estimation, the discrete Fourier transform, laws of large numbers, autoregressive moving average processes. Offered in odd-numbered years.

237B. Time Series Analysis: Statistical Inference (3) II. The Staff
Lecture—3 hours. Prerequisite: courses 131B-131C and 237A. Multivariate normal processes, spectral estimation, tests of hypotheses, regression, discrimination filtering, spectral analysis of variance, ARIMA processes, state space models, and maximum likelihood estimation. Offered in even-numbered years.

238A. Theory of Multivariate Analysis I (3) II. The Staff
Lecture—3 hours. Prerequisite: course 231C or consent of instructor. Review of matrix algebra; Jacobians; standard multivariate normal distribution theory; multiple, partial, and canonical correlation; maximum likelihood estimation; properties of the Wishart distribution; Hotelling's T^2 test; union intersection principle; simultaneous linear compounds; likelihood ratio testing procedure; multivariate regression analysis. Offered in odd-numbered years.

238B. Theory of Multivariate Analysis II (3) III. The Staff
Lecture—3 hours. Prerequisite: course 238A. Multivariate analysis of variance; profile analysis; growth curve analysis; principal component analysis; inferences on covariances; factor analysis. Classification and discrimination; distribution of characteristic roots. A Bayesian approach to multivariate analysis. Testing independence of sets of variates, canonical correlations, cluster analysis. Offered in odd-numbered years.

290. Seminar in Statistics (1-6) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Seminar on advanced topics in probability and statistics. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

NOTE: For key to footnote symbols, see page 123.

Special topics in statistics appropriate for study at the graduate level.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Special topics in statistics appropriate for study at the graduate level. (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff
Prerequisite: candidate for Ph.D. degree. Research in statistics under the supervision of major professor. (S/U grading only.)

Professional Course

401. Methods in Statistical Consulting (3) I, II, III. The Staff
Supervised consultation—3 hours. Prerequisite: graduate standing in Statistics. Students observe faculty consulting with clients and discuss with faculty methods of analyzing their data or of designing their experiments. Students may also perform data analysis. Following this, students do supervised, then unsupervised, but reviewed, statistical consulting. May be repeated once for credit. (S/U grading only.)

Statistics (A Graduate Group)

Robert H. Shumway, Ph.D., Acting Chairperson of the Group

Group Office, 469 Kerr Hall (752-2361)

Faculty

The Group has approximately thirty faculty members from all colleges, schools, and divisions, including twelve from the Intercollege Division of Statistics.

Graduate Study. The Graduate Group in Statistics offers programs of study and research leading to the M.S. and Ph.D. degrees. For detailed information, see the *Graduate Announcement*, or contact the Chairperson of the Group.

Graduate Advisers. P.K. Bhattacharya (Statistics), M.S. degree; Y.P. Mack (Statistics), Ph.D. degree.

Subject A

See under University Requirements, page 61; or English A course, page 200.

Surgery

Medicine, see page 267; Veterinary Medicine, see below.

Surgery

(School of Veterinary Medicine)

Eugene P. Steffey, V.M.D., Ph.D., Chairperson of the Department

Department Office, 2112 Medical Science 1A (752-3599)

Faculty

Cleta S. Bailey, D.V.M., Ph.D., Assistant Professor
Roy W. Bellhorn, D.V.M., M.S., Professor
Eugene M. Breznock, D.V.M., Ph.D., Associate Professor
Ned Buyukmihci, V.M.D., Assistant Professor
Robert M. Cello, D.V.M., Professor
I. M. Gourley, D.V.M., Ph.D., Professor
Clare R. Gregory, D.V.M., Assistant Professor
Steve C. Haskins, D.V.M., M.S., Associate Professor
Susan V. Hildebrand, D.V.M., Assistant Professor
Terrell A. Holliday, D.V.M., Ph.D., Professor
Andrew B. Kelly, Jr., D.V.M. Assistant Professor
Robert L. Leighton, V.M.D., Professor Emeritus
Bruce R. Madewell, V.M.D., Associate Professor
Dennis M. Meagher, D.V.M., Ph.D., Professor
Harold R. Parker, D.V.M., Ph.D., Professor
John R. Pascoe, B.V.Sc., Assistant Professor
Harold D. Snow, D.V.M., Associate Adjunct Professor *(School of Medicine, Los Angeles campus)*
Eugene P. Steffey, V.M.D., Ph.D., Professor
Gordon H. Theilen, D.V.M., Professor
Philip Vasseur, D.V.M., Assistant Professor
John D. Wheat, D.V.M., Professor
Alida P. Wind, D.V.M., Lecturer

Part-Time Clinical Faculty

Gregory L. Ferraro, D.V.M., Assistant Clinical Professor
Charles T. Robinson, D.V.M., Assistant Clinical Professor
Randall H. Scagliotti, D.V.M., Assistant Clinical Professor

Courses in Surgery

Upper Division Course

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Steffey in charge)
(P/NP grading only.)

Graduate Courses

228. Anesthesia in Research (1) III. Steffey
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.

291. Anesthesia/Critical Care Basic Science Conference (1) I, II, III. The Staff (Steffey in charge)
Discussion—1 hour. Prerequisite: postdoctoral, medical or graduate student; consent of instructor. Advanced course in scientific foundations of animal anesthesia and critical care. Format is directed by discussion following reading of assigned material emphasizing foundations in pharmacology and physiology. (S/U grading only.)

293. Anesthesia/Critical Care Case Management Conference (1) I, II, III. The Staff (Steffey in charge)
Discussion—1 hour. Prerequisite: postdoctoral, medical or graduate student; consent of instructor. Discussion of VMTH case material to illustrate specific medical problems and their preventive and corrective management. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Steffey in charge)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Courses

410. Small Animal Surgery (1½ per week) I, II, III. The Staff (Breznock in charge)
Laboratory—50 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for preoperative preparation of hospital patients, assistance at operating and 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. Surgery (1½ per week) I, II, III. The Staff (Breznock in charge)
Laboratory—50 hours. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for care of pet animal patients in the hospital including physical examinations, presurgical work-ups, surgery, postoperative care and follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

412. Large Animal Surgery (1½ per week) I, II, III. The Staff (Wheat in charge)
Laboratory—50 hours. Prerequisite: professional standing, intern in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for care of farm animal surgical patients in the hospital and outpatient clinic including physical examinations, presurgical work-up, assistance at operations, surgery, post-surgical care and follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

414. Veterinary Anesthesiology (1½ per week) I, II, III. The Staff (Steffey in charge)
Laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns responsible for anesthetic care of patients in the operating rooms under the supervision of the senior staff. May be repeated for credit. (S/U grading only.)

420. Veterinary Neurology (1½ per week) I, II, III. Holliday
Laboratory—50 hours. Prerequisite: professional standing, intern or resident in Veterinary Medical Teaching Hospital, or consent of instructor. Interns and residents responsible for care of hospital and outpatients including history taking, neurologic examinations and special diagnostic and therapeutic procedures under the direction of the staff neurologist. (S/U grading only.)

422. Veterinary Ophthalmology (¾-1½ per week) I, II, III. Buyukmihci
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 out-patient clinic including history taking, ophthalmologic examinations, special dagnostic techniques, assistance at ophthalmologic surgery and medical and post surgical care under the direction of the staff ophthalmologist. May be repeated for credit. (S/U grading only.)

492. Large Animal Grand Rounds (4) I, II, III. The Staff (Wheat in charge)
Discussion—1 hour. Prerequisite: professional standing; intern or resident in Veterinary Medical Teaching Hospital or consent of instructor. Interns and residents take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. (S/U grading only.)

Swedish

See Scandinavian

Textiles (A Graduate Group)

S. Haig Zeronian, Ph.D., D.Sc., Chairperson of the Group

Group Office, 129 Everson Hall (752-6650)

Faculty. The Group includes the faculty from the Division of Textiles and Clothing as well as from a variety of other departments representing related disciplinary fields.

Graduate Study. The Graduate Group in Textiles offers a program of study and research leading to the M.S. degree. For detailed information regarding the program, address the Chairperson of the Group.

Graduate Adviser. S. H. Zeronian (Textiles and Clothing).

Textiles and Clothing

(College of Agricultural and Environmental Sciences)

S. Haig Zeronian, Ph.D., D.Sc., Chairperson of the Division

Division Office, 129 Everson Hall (752-6650)

Faculty

You-Lo Hsieh, Ph.D., Assistant Professor
Susan B. Kaiser, Ph.D., Assistant Professor
Mary Ann Morris, Ph.D., Professor
Howard L. Needles, Ph.D., Professor
Margaret H. Rucker, Ph.D., Associate Professor
Howard G. Schutz, Ph.D., Professor
S. Haig Zeronian, Ph.D., D.Sc., Professor

The Major Program

The Textiles and Clothing major is concerned with the study of the socioeconomic and physical science aspects of textiles and clothing including physical and chemical properties, applications, structure, and care of fibers and fabrics, and their production and end-use. All students in the major are required to take a common core of preparatory subject matter balanced between the social sciences-humanities and physical sciences and depth subject matter in textiles and clothing as well as in business. The student is expected to have a particular area of emphasis in textiles through careful selection of restricted electives in consultation with an adviser. This major prepares you for a career in textiles and clothing and related fields including merchandising and marketing, production, testing, quality control, technical service, textile journalism, and design. Those interested in careers in extension service and teaching should consult with their adviser. Graduates are qualified to enter the graduate program in Textiles, and Textiles and Clothing or Textile Science programs at other universities.

Textiles and Clothing

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**82–83**
Introductory psychology (Psychology 1)	4
Sociology (Sociology 1)	5
Economics, including general principles and accounting (Economics 1A-1B, 11A-11B)	18
Written expression, two courses (see College requirement)	8
Oral expression, one course (see College requirement)	4
Chemistry, including organic (Chemistry 1A, 1B, 8A, 8B)	16
Satistics, one course (Statistics 13 or Economics 12)	4–5
Physics (Physics 1A, 1B)	6
Computer Science (Computer Science Engineering 20 or Agricultural Science and Management 21)	3
History of art (Art 10HA) or cultural anthropology (Anthropology 2)	4
Textiles and Clothing 6, 7, 8	10
Depth Subject Matter	**36–38**
Textiles, courses selected from Textiles and Clothing 17-17L, 161-161L, 162-162L, 163-163L, 164, 165, 170, 173, 177	24–25
Agricultural Economics 112, 113	8
Design 143, Psychology 183 or Economics 101	4–5
Restricted Electives	**20**
Courses selected from the following: Agricultural Economics 18, 117, 155, 171A, 171B; Agricultural Science and Management 150; Applied Behavioral Sciences 162; Consumer Economics 141 or 141M, 142; Consumer Science 100; Design 142A, 142B, 160A, 160B, 160C, 170A, 170B, 170C; Economics 100, 121A, 121B, 134; Mathematics 16A, 16B, 16C; Psychology 145; Rhetoric 42, 140; Sociology 25, 123, 126, 140, 148, 159, 175; Statistics 106, 108; Textiles and Clothing 47, 90, 180A, 180B, and courses not taken under Depth Subject Matter above.	
Unrestricted Electives	**39–42**
Total Units for the Major	**180**

Major Adviser. S.B. Kaiser.

Minor Program Requirements:

The Division of Textiles and Clothing offers two minor programs for non-majors interested in satisfying secondary career objectives.

	UNITS
Textiles and Clothing	**18**
One course from Textiles and Clothing 6, 7, 8, 17-17L	3-4
Courses selected from Textiles and Clothing 161-161L or 163-163L, 162-162L, 164, 165, 170, 173, 177	10-15
Course selected from Agricultural Economics 112, 113, Design 143	0-4

Minor Adviser. S.B. Kaiser

	UNITS
Textiles Science	**18**
Textiles and Clothing 6	4
Courses selected from Textiles and Clothing 100, 161-161L, 162-162L, 163-163L, 165	14

Minor Adviser. H.L. Needles.

Graduate Study. A program of study is offered leading to the M.S. degree in Textiles. Information can be obtained from the graduate adviser. Also see page 94.

Related Courses. See courses in Consumer Science and Design.

Courses in Textiles and Clothing

Questions pertaining to the following courses should be directed to the instructor or to the Division of Textiles and Clothing.

Lower Division Courses

6. Introduction to Textiles (4) I, Morris
Lecture—3 hours; laboratory—3 hours. Introduction to the structure and properties of textiles. Consumer use and fabric characteristics are emphasized.

7. Social and Psychological Aspects of Dress (3) II, III. Kaiser
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.

8. The Textiles and Apparel Industries (3) I, Rucker
Lecture—3 hours. Study of the textile and apparel industries including fashion theory, production, distribution, and consumption of textile goods.

17. Introduction to Clothing structure (3) II. Hsieh
Lecture—3 hours. Introduction to basic principles of deriving two-dimensional patterns for three-dimensional clothing structure components. Development of classic clothing structure variations by drafting, flat pattern, and draping principles. Evaluation and modification of patterns by draping.

17L. Clothing Structure Laboratory (1) II. Hsieh
Laboratory—3 hours. Prerequisite: course 17 (may be taken concurrently). Development of basic foundation patterns for clothing structures by drafting and draping. Derivations of clothing structures from basic patterns by flat pattern manipulation. Pattern evaluation, modification, labelling, and transferring techniques included.

47. Field Study (1) III. Kaiser, Rucker
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 preenrollment. (P/NP grading only.)

90. Challenges and Opportunities in Textiles and Clothing (1) III. Kaiser, Rucker
Seminar—1 hour. One hour seminar per week at which specialists in selected areas of textiles and clothing survey their part in today's industry, indicating challenges, opportunities and prospects for the appropriately trained university graduate. May be repeated for credit. (P/NP grading only.)

92. Internship in Textiles and Clothing (1-12) I, II, III. The Staff (Zeronian in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience off campus in a textiles or clothing-related area. Supervision by a member of the Textiles and Clothing faculty. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Zeronian in charge)
(P/NP grading only.)

Upper Division Courses

100. Principles of Polymer Materials Science (3) III. Needles, Zeronian
Lecture—3 hours. Prerequisite: Chemistry 1A-1B or 4A-4B Chemistry 8A-8B or Engineering 45; introductory physics. The basic principles of polymer science are presented including polymer structure and synthesis; polymerization mechanisms, polymer classes, properties, and reactions; polymer morphology, rheology, and characterization; polymer processing. (Same course as Engineering 147.)

161. Structure and Properties of Fibers (3) I, Zeronian
Lecture—3 hours. Prerequisite: course 6 and Chemistry 8B. The structure, properties and reactions of natural- and man-made fibers; the relations between molecular structure of fibers and their physical properties; interactions of fibers and detergents.

161L. Textile Chemical Analysis Laboratory (1) I, Zeronian
Laboratory—3 hours. Prerequisite: course 161 (may be taken concurrently). Laboratory methods and procedures employed in qualitative and quantitative analysis of textile fibers and auxiliaries.

162. Textile Fabrics (3) II. Morris
Lecture—3 hours. Prerequisite: course 6. Properties of fabrics as related to serviceability, comfort, and appearance.

162L. Textile Fabrics Laboratory (1) II. Morris
Laboratory—3 hours. Prerequisite: course 162 (may be taken concurrently). Laboratory methods and procedures employed in studying properties of textile fabrics as related to serviceability, comfort, and appearance.

163. Textile Coloration and Finishing (3) III. Needles
Lecture—3 hours. Prerequisite: course 6, Chemistry 8B, Physics 1B. Basic principles of dyeing, printing, and finishing of textiles; color theory, structure and properties of dyes and finishes; the effect of variables and auxiliaries on dyeing, printing, and finishing; dye and finish fixation and fastness.

163L. Textile Coloration and Finishing Laboratory (1) III. Needles
Laboratory—3 hours. Prerequisite: course 163 (may be taken concurrently). Demonstrates various aspects of dyeing, printing, and finishing of textile substrates including the effect of fiber and finish type, and physical and chemical variables on dyeing and finishing processes and on the properties of the resultant textile.

164. Principles of Apparel Production (3) III. Hsieh
Lecture—3 hours. Prerequisite: course 17; courses 6 and 8 are recommended. Overview of research, theoretical basis, technology and processes in the apparel manufacturing industries including study of product engineering, materials utilization and fabrications, management controls, mechanization, production engineering.

165. Textile Processes (3) II. Needles
Lecture—3 hours. Prerequisite: course 6; Physics 10 or 1A. Explores the physical processes involved in production of textiles from the individual fiber to the finished fabric. Includes spinning, texturizing, yarn formation, weaving preparation, weaving and knitting, tufting, non-woven formation, fabric preparation, and finishing.

170. Advanced Clothing Structure (4) III. Hsieh
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 6, 17, 17L. Analysis of drafting, flat pattern, and draping principles and the combined utilization and application of these principles. Comparative analysis of the interrelationships of clothing structure development for efficient and functional applications.

173. Principles of Fashion Marketing (3) II. Rucker
Lecture—3 hours. Prerequisite: course 8, Economics 1A, Agricultural Economics 113 or 136. Study of basic elements of fashion marketing including philosophy and objectives, organization merchandising, pricing, promotion and personnel.

177. Clothing and Social Perception (3) III. Kaiser
Lecture—3 hours. Prerequisite: course 7; Sociology 1; Psychology 1. Social and cognitive processes related to the meanings people assign to clothing cues when perceiving one another. Particular attention to the following appearance-related stereotypes: age, sex, physical attractiveness, status, ethnicity. Influences of clothing and appearance on social interactions.

180A-180B. Introduction to Research in Textiles (2-2) I, II, III. The Staff (Zeronian in charge)
Laboratory—6 hours. Prerequisite: senior standing with tex-

NOTE: For key to footnote symbols, see page 123.

tile-related major, and consent of instructor. Senior thesis on independent problems. Research begun in course 180A will be continued and completed in course 180B. (Deferred grading only, pending completion of sequence.)

192. Internship in Textiles and Clothing (1-12) I, II, III. The Staff (Zeronian in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience off campus in a textiles or clothing-related area. Supervision by a member of the Textiles and Clothing faculty. (P/NP grading only.)

197T. Tutoring in Textiles and Clothing (1-5) I, II, III. The Staff (Zeronian in charge)
Discussion-Laboratory—3-15 hours. Prerequisite: upper division textiles-related major and consent of instructor. Tutoring of students in Textiles and Clothing courses. Assistance with discussion groups and laboratory sections under supervision of instructor. May be repeated for credit if tutoring another textiles course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Zeronian in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Zeronian in charge)
(P/NP grading only.)

Graduate Courses

210. Textile Physical and Chemical Processes (3) III. Needles
Lecture—3 hours. Prerequisite: courses 163, 165. Theoretical aspects of physical and chemical treatment of textile fiber yarns and fabrics. Textile pre- and post-treatment, physical processing, chemical finishing, and dyeing. Effect of processes on textile and end-use properties and on the environment. Offered in odd-numbered years.

220. Textile Product Quality and Standards (3) II. Zeronian
Lecture—3 hours. Prerequisite: course 161. Principles involved in establishing standards for implementation of government laws and regulations concerning textiles and clothing and quality controls for textile products. Offered in even-numbered years.

230. Behavioral Science Concepts in Textiles (3) II. Rucker
Lecture—3 hours. Prerequisite: course 7, upper division or graduate course in statistics (e.g., Agricultural Science and Management 150) and one in a behavioral science (e.g., Psychology 145). Examination of theories and research concerning relationships between clothing and human behavior with emphasis on research techniques, including methods of measuring clothing variables.

290. Seminar (1) I, II. Zeronian
Seminar—1 hour. Critical review of selected topics of current interest in textiles. (S/U grading only.)

290C. Research Conference (1) I, II, III. The Staff (Zeronian in charge)
Discussion—1 hour. Prerequisite: graduate standing; consent of instructor. Individual faculty members meet with their graduate students. Critical presentations of original research are made by graduate students. Research activities are planned. Discussions are led by major professors for their research groups. (S/U grading only.)

293. Recent Advances in Textiles (3) III. The Staff (Zeronian in charge)
Lecture—3 hours. Prerequisite: two upper division courses in Textiles and Clothing or consent of instructor. Critical reading and evaluation on selected topics of current interest in textiles. Multidisciplinary aspects of the topics selected will be stressed. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Zeronian in charge)

299. Research (1-12) I, II, III. The Staff (Zeronian in charge)
(S/U grading only.)

Textile Science

(College of Agricultural and Environmental Sciences)

The Major Program

The Textile Science major is concerned with the physical, chemical, and structural properties of fibers and fabrics, textile dyeing and finishing, polymer science and the relation of these aspects to fiber and fabric performance and end-use. All students in this major are required to take a common core of coursework in chemistry, physics, and mathematics coupled with selected social sciences-humanities courses, and depth subject matter in textile science, statistics, and technical writing. The student is expected to emphasize a particular aspect such as physical sciences, mathematics, economics, or textiles and clothing through selection of appropriate restricted electives in consultation with an adviser. The major prepares the student for a career in textiles or fiber science and other polymer-related areas including research and development, technical service, technical marketing, production, quality control, and science teaching (on completion of an additional year in the teaching credential program). Graduates are prepared to enter the graduate program in Textiles or Agricultural and Environmental Chemistry with a specialization in Textile Chemistry, and Textile Science or Fiber and Polymer Science programs at other universities.

Textile Science

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *(Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**62–65**
Chemistry, including general and analytical (Chemistry 1A, 1B, 1C, 5)	19
Computer science (Computer Science Engineering 8 or 20)	3
Mathematics (Mathematics16A-16B-16C or 21A-21B-21C)	9–12
Physics (Physics 2A-2B-2C)	12
Statistics (Statistics 13 or Agricultural Science and Mangement 150)	4
Written and oral expression (see College requirement)	8
Textiles and Clothing 6, 8	7
Depth Subject Matter	**30**
Textile science courses selected from Textiles and Clothing 100, 161-161L, 163-163L, 165, 180A, 180B, 220, 293	18
Organic chemistry (Chemistry 128A, 128B, 128C)	9
English 104	3
Breadth Subject Matter	**20**
Social science and humanities	20
Restricted Electives	**30**
Select courses from the following: Agricultural Economics 18, 112, 113, 117, 171A, 171B; Agricultural Science and Management 21; Bacteriology 2, 3; Biological Sciences 1; Chemistry 107A, 107B, 108 or 110A, 110B, 110C, 121, 130; Economics 1A, 1B, 11A, 11B, 100, 101, 121A, 121B, 134; Mathematics 22A, 22B; Physics 3A, 3B, 3C; Statistics 32, 106, 108; Textiles and Clothing 7, 17, 17L, 47, 90, 162, 162L, 164, 170, 173, 177 and courses not taken under Depth Subject Matter above.	
Unrestricted Electives	**35–38**
Total Units for the Major	**180**

Major Adviser. H.L. Needles *(Textiles and Clothing).*

Graduate Study. A program of study is offered leading to the M.S. degree in Textiles. Information can be obtained from the graduate adviser. Also see page 94.

Vegetable Crops

(College of Agricultural and Environmental Sciences)

Donald J. Nevins, Ph.D., Chairperson of the Department

Department Office, 152 Hunt Hall (752-0516)

Faculty

Alan B. Bennett, Ph.D., Assistant Professor
Arnold J. Bloom, Ph.D., Assistant Professor
Kent J. Bradford, Ph.D., Assistant Professor
James F. Harrington, Ph.D., Professor Emeritus
John D. Hewitt, Ph.D., Assistant Professor
Frederick D. Howard, Ph.D., Senior Lecturer Emeritus
Doran L. Hughes, Ph.D., Adjunct Lecturer
Richard A. Jones, Ph.D., Associate Professor
Oscar A. Lorenz, Ph.D., Professor Emeritus
James M. Lyons, Ph.D., Professor
Richard W. Michelmore, Ph.D., Assistant Professor
Leonard L. Morris, Ph.D., Professor Emeritus
Donald J. Nevins, Ph.D., Professor
Thomas J. Orton, Ph.D., Assistant Adjunct Professor
Harlan K. Pratt, Ph.D., Professor Emeritus
Carlos F. Quiros, Ph.D., Assistant Professor
Lawrence Rappaport, Ph.D., Professor
Charles M. Rick, Ph.D., Professor
Vincent Rubatzky, Ph.D., Adjunct Lecturer
Mikal E. Saltveit, Jr., Ph.D., Assistant Professor
Carol Shennan, Ph.D., Assistant Professor
William L. Sims, Ph.D., Adjunct Lecturer
Paul G. Smith, Ph.D., Professor Emeritus
Arthur R. Spurr, Ph.D., Professor Emeritus
Herman Timm, Ph.D., Adjunct Lecturer
Ronald E. Voss, Ph.D., Adjunct Lecturer
James E. Welch, Ph.D., Lecturer Emeritus
Masatoshi Yamaguchi, Ph.D., Professor Emeritus
Shang Fa Yang, Ph.D., Professor
Frank W. Zink, Jr., M.S., Lecturer

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 94.

Graduate Adviser. J.D. Hewitt.

Related Courses.

See Plant Science 2, 101, 102, 112, 112L, 113, 221A, 221B.

Courses in Vegetable Crops

Questions pertaining to the following courses should be directed to the instructor or to the Advising Office, 258 Hunt Hall.

Lower Division Course

92. Internship in Vegetable Crops (1-6) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Work-learn experience off or on campus in all subject areas pertaining to vegetable crops. Internships supervised by a member of the faculty. Maximum of 12 units permitted in the Vegetable Crops 92-192 series. (P/NP grading only.)

Upper Division Courses

101. Principles of Vegetable Crops Production (4) II. Lyons
Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 2 and/or Plant Science 2. Fundamentals of vegetable crop production, handling, processing, utilization and distribution.

105. Systematic Olericulture (4) I, Saltveit
Lecture—2 hours; laboratory—6 hours; field trip(s) and written and oral reports. Prerequisite: Botany 2; Botany 108 recommended. Taxonomic and horticultural classification of the more important vegetable cultivars, their origin, morphology, nomenclature, and description; wild vegetable species, minor and exotic vegetables, and trends in development of new cultivars.

118. Seed Physiology and Production (3) II. Bradford
Lecture—3 hours. Prerequisite: Botany 111B. Physiological factors affecting germination of seeds, seed development, viability and longevity of seed. Principles of seed production. One or more field trips.

***130. Mushrooms of California** (3) II. The Staff
Lecture—2 hours; discussion—1 hour; laboratory—2 hours; field trips. Prerequisite: upper-division standing and/or consent of instructor. Introduction to the culture, food value and culinary aspects of market mushrooms and techniques of identification of wild mushrooms. Oral and written reports and a final examination form the basis for grading.

150. World Vegetable Crops (3) III. Hughes
Lecture-discussion—3 hours. Prerequisite: Plant Science 2 or Botany 2; course 101 recommended. Survey of vegetables

NOTE: For key to footnote symbols, see page 123.

of the world with emphasis on tropical, subtropical, and exotic vegetables. Principle topics considered are botany, origin, geographic distribution, ecology, culture, physiology, current research, and use. Written and oral reports are made on vegetable production of a region or country or on selected vegetable crops.

192. Internship in Vegetable Crops (1-12) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: consent of instructor. Work-learn experience off or on campus in all subject areas pertaining to vegetable crops. Internships supervised by a member of the faculty. Maximum of 12 units permitted in the Vegetable Crops 92-192 series. (P/NP grading only.)

195. Field Study of Vegetable Industry (1) III. The Staff
Field Study. 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 preenrollment. (P/NP grading only.)

197T. Tutoring in Vegetable Crops (1-3) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-9 hours. Prerequisite: consent of instructor. Voluntary tutoring for upper division students who desire teaching experience. Under supervision students may prepare laboratory materials, experiments, and autotutorial modules, conduct discussions and demonstrations, and be involved in testing. May be repeated up to a total of 6 units.

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

212. Postharvest Physiology of Vegetables (4) III. Yang
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. Lectures stress species responses and requirements. Laboratories stress concepts and research procedures.

220. Vegetable Genetics and Improvement (4) I, Michelmore
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-incompatability, flower structure, pollen vectors, and other reproductive factors. Problems of chromosome number and structure, heterosis, pest resistance, and species hybrids peculiar to vegetable improvement.

230. Selected Methods in Vegetable Research (3) III. Bennett
Lecture—1 hour; laboratory—6 hours. Prerequisite: one course from Plant Science 102, Botany 111A, 111B, Biochemistry 101A-101B, or 101L. Survey of the theory and practice of certain laboratory methods and techniques used in vegetable/plant research, with emphasis on determination of plant constitutents, physiological functions and cell/tissue culture.

290. Seminar (1) I, II, III. Bradford, Michelmore, Bloom
Discussion—1 hour. (S/U grading only.)

291. Special Topics in Vegetable Crops (2) I, II. Nevins
Lecture—1 hour; discussion—1 hour. Prerequisite: graduate student standing. In-depth coverage of selected topics in vegetable crops and related disciplines. Topics and course format determined by instructor in charge for each quarter. Assignments may include reports analyzing and evaluating selected lectures. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Current concepts, techniques, and procedures applicable to research and to the production of vegetables.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

300. Tutoring in Vegetable Crops (1-3) I, II, III. The Staff (Chairperson in charge)
Tutoring—3-9 hours. Prerequisite: consent of instructor. Voluntary tutoring for graduate students who desire teaching experience, but who are not teaching assistants. Students under supervision may give lectures, prepare laboratory materials, experiments, and autotutorial modules, conduct discussions and demonstrations, and be involved in testing. May be repeated for a total of 6 units. (S/U grading only.)

Veterinary Medicine, School of

Edward A. Rhode, D.V.M., Dean of the School
George H. Cardinet III, D.V.M., Ph.D., Associate Dean—Instruction
Bennie I. Osburn, D.V.M., Ph.D., Associate Dean—Research
Donald G. Low, D.V.M., Ph.D., Associate Dean—Public Programs
Robert J. Hansen, Ph.D., Associate Dean—Student Services
[6]William J. Winchester, D.V.M., Assistant Dean

School Office, 1024 Haring Hall (752-1360)

Courses in Veterinary Medicine

Upper Division Course

192. Work-Study Experience in Veterinary Science (1-12) I, II, III. Cardinet
Work-experience—3-36 hours; final report. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-study experience in Veterinary Medicine. (P/NP grading only.)

Graduate Courses

226. Advanced Small Animal Cardiology (1½) II. Thomas
Lecture—15 hours total. Prerequisite: course 425B or the equivalent. Cardiovascular diseases of canine and feline species.

249. Summer Clinics (5 or 16) Extra-session summer. Hjerpe
Active participation in clinic—40 hours (either four or six weeks). Prerequisite: completion of first-year in School of Veterinary Medicine. Diagnosis and treatment of animal diseases. Students responsible for case records, care of patients, physical examinations, and participation in surgery. Grades determined by the teaching faculty by observation of student's performance of assigned duties, by rounds and discussions, the preparation of case records, and competence and responsibility shown in the care of patients. In some sessions, students serve in the emergency, on-call capacity. Student has option of completing one to two sessions. (S/U grading only.)

Professional Courses

400A. Veterinary Medicine Orientation (no credit) I, McGowan
Discussion—8 two-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. An overview of the veterinary medical profession emphasizing its many integrants and publics. (S/U grading only.)

400B. Veterinary Medicine Orientation (1) III. East
Laboratory—8 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Recognition of animal breeds, breed characteristics and purpose in animal species of veterinary importance. Introduction and practice of procedures of animal handling and restraint and selected techniques of diagnostic examination and therapy. (S/U grading only.)

401. The Normal Animal, Examination and Topographic Anatomy (3) I, Kitchell
Lecture—10 hours; discussion—10 two-hour sessions; laboratory—10 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. Anatomic structures, features and landmarks fundamental to an integrated study of organ systems, the performance of physical examination, routine diagnostic and therapeutic procedures.

402A. Cell Biology (3.5) I, Plopper
Lecture—22 hours; discussion—5 two-hour sessions; laboratory—8 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine.† A functional and structural study of cells and their organelles with emphasis on the organization and specialization of cells to form the primary tissues of the body.

403A. Principles of Pharmacology (2.7) III. Joy
Lecture—26 sessions total; laboratory—1 three-hour session total. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Designed to provide veterinary medical students with a basic foundation for understanding how drugs are used to restore diseased animals to normal health. Course introduces principles of pharmacology and begins a consideration of drugs by pharmacological class.

403B. Pharmacology (2.5) I, Giri
Lecture—21 sessions total; laboratory-demonstration—4 three-hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine. Mechanisms and effects of drugs on various organ systems from a comparative, animal oriented viewpoint. Laboratories are designed to demonstrate the application of such material to therapeutics.

404. Fundamentals of Radiography (2.7) II. Hornof, Turrel
Lecture—23 sessions total; laboratory—4 three-hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine. Ionizing radiation and its interaction with matter and biological systems; instrumentation and principles of diagnositic radiology, radiotherapy and nuclear medicine; diagnostic applications of x-rays and basic principles of veterinary radiology.

405A. Parasitology (3.8) II. Wong, Baker
Lecture—28 hours; demonstration laboratories—10 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine.† Course is intended to serve as an introduction to veterinary parasitology. Emphasis is placed on the recognition, life-cycle and ecology of antropods helminth and protozoan parasites of domestic animals. The relationship of these parasites to disease is briefly discussed.

405B. Clinical Parasitology (3) III. Baker
Lecture—2 hours; laboratory—10 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor.† Ecology, pathology, diagnosis, and therapeusis of the more important parasites of domestic animals.

406. Principles of Behavior (1.1) I, Hart
Lecture—1 hour; laboratory—1 session. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor.† Normal behavioral patterns dealing with feeding, eliminative, social, sexual and maternal behavior of domestic livestock and pets. Determinants of behavior including genetics, early experience, learning and hormones.

407A. Principles of Surgery (1.2) III. Vasseur
Lecture—10 sessions total; laboratory—2 three-hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine. Concept of total patient care will be developed and applied to patient undergoing surgical management. Current principles of surgical physiology emphasized.

407B. Principles and Techniques of Surgery (2) I, Gourley
Lecture—9 sessions total; laboratory—9 three-hour sessions total; discussion—3 three-hour sessions total. Prerequisite: third-year standing in School of Veterinary Medicine. Continuation of course 407A. Introduces the veterinary student to technical aspects of surgical science. Specific operative procedures performed by the student provide opportunity to learn fundamental skills of asepsis, instrument identification and manipulation, knot tying, hemostasis and tissue dissection.

407C. Surgical Anatomy (1) I, Lohse
Laboratory—3 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Study of anatomical topics as applied to selected surgical operations. Topographical features useful to approaching organs and structures described. Tissues and structures basic to surgery emphasized.

408. Nutrition and Nutritional Diseases in Animals (3.8) II. Morris
Lecture—36 hours total; 1 three-hour fieldtrip; laboratory—1 three-hour session. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor.† Principles of nutrition and their application to the feeding of small and large animals. Selected clinical material will be discussed in relation to deficiency symptoms, pathology and biochemical lesions.

409. Epidemiology (2) III. Hird
Lecture—20 sessions total. Prerequisite: first-year standing in School of Veterinary Medicine. Introduction to epidemiology and its applications in veterinary medicine.

410. Veterinary Toxicology (2.8) III. Fowler
Lecture—28 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine.† Diseases of animals produced by chemical poisons, organic and inorganic. The prevalence of toxic agents in the environment and exposure of animals to them; the incidence, pathology, pathogenesis, diagnosis and treatment of diseases produced by poisons will be discussed.

411A. Laboratory Animal Medicine (2) II. Brooks
Lecture—20 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Diagnostic, therapeutic and preventive methods for diseases of rabbits, guinea pigs, hampsters and certain related laboratory rodents will be presented to serve the needs of clinical and research veterinarians. Lecture demonstrations with subject species will be provided.

412. Laboratory Animal Medicine (2) III. Brooks
Lecture—20 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Prevention, diagnosis and therapy of medical problems in rabbits, guinea pigs, hamsters, mice, rats and other laboratory species. Emphasis will be placed on animal colony health management technique, and concepts of preventive

NOTE: For key to footnote symbols, see page 123.

disease needed by veterinarians in charge of research facilities.

413. Medical Primatology (2) III. Henrickson
Lecture—2 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Major diseases, medical management and husbandry of captive nonhuman primates. (S/U grading only.)

414. Integrative Physiological Chemistry (6.6) I, Black
Lecture—47 hours total; discussion—10 hours total; laboratory—3 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine. Physical-chemical principles underlying biological processes; intermediary metabolism and its control. Course will emphasize structural-functional relationship from the molecular to the tissue level to give a background for understanding.

415. Management and Disease of Captive Wildlife (2) III. Fowler
Lecture—20 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Lectures, demonstrations, and discussions used to illustrate selected medical problems of captive wild animals.

416. Aquatic Animal Medicine (2) III. The Staff (Ardans in charge)
Lecture—20 hours total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Etiology, pathology, diagnosis, treatment and prevention of diseases of fish and of some aquatic arthropods and mammals. Preventive management of diseases in aquaculture.

417. Cage Bird Medicine (2) II. Fowler
Lecture—2 hours. Prerequisite: third-year veterinary medical student 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.

418. Diseases of Free Living Wildlife (2) II. Fowler
Discussion—20 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Lectures on the ecology and epidemiology of disease in free-living wild animals including medical management of free-living populations.

419A. Behavior Therapy in Small Animal Practice (.8) III. Hart
Lecture—5 hours total; laboratory—9 hours total. Prerequisite: third-year standing in School of Veterinary Medicine.† Clinical application of drug therapy and conditioning procedures to specific type of problem behavior in pet dogs and cats. Overview of pet-owner behavioral interactions. Behavioral consideration in advising clients in selection and raising of dogs and cats.

419B. Application of Behavioral Principles and Large Animal Practice (.8) III. Hart
Lecture—8 hours total. Prerequisite: third-year standing in School of Veterinary Medicine.† Evaluation of the natural behavioral tendencies of large animals as they relate to modern husbandry and herd health practices. Behavioral stress and disease processes. Treating problems with reproductive behavior. Animal-owner interactions. Species considered are cattle, sheep, swine and horses.

420A. Musculoskeletal Basis of Locomotion (4.9) I, II. Hyde
Lecture—18 hours total; laboratory—31 hours total. Prerequisite: first-year standing in School of Veterinary Medicine.† Gross, subgross, light microscopic, electron microscopic, functional anatomy of the musculoskeletal system of selected domestic animals.

420B. Musculoskeletal System-Abnormal Functions (4.5) III. Wind
Lecture—38 hours total; laboratory—7 three-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine.† Abnormal function of the musculoskeletal system and diseases affecting the musculoskeletal system in animals. The manifestations, pathology, pathogenesis, diagnosis and medical and surgical treatments of musculoskeletal disease will be discussed.

421A. Neurosciences (4.2) II. Kitchell
Lecture—33 hours total; laboratory—9 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine.† An integrated study of the nervous system including gross and microscopic anatomy, neurophysiology and neurological examination of animals.

421B. Neurology-Abnormal (3.5) III. Holliday, Bailey
Lecture—28 sessions total; laboratories—7 sessions total. Prerequisite: second-year standing in School of Veterinary Medicine.† Abnormal function of the nervous system and diseases affecting the nervous system in animals. Manifestations of diseases, pathology, pathogenesis, diagnosis and medical and surgical treatments of neurologic diseases will be discussed.

422. Veterinary Ophthalmology (2.8) II. The Staff
Lecture—21 hours total; laboratory—7 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine.† Normal structure and function of the eye and the response of the eye to disease. All species of domestic animals will be included. Discussing of selected ocular diseases of various species.

423. Small Animal Ophthalmology (2) III Buyukmihci
Lecture—20 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Diagnosis and treatment of commonly encountered eye diseases of small animals and nondomestic animals.

424. Current Topics in Veterinary Oncology (1) III. Theilen, Madewell
Lecture—2 one-hour sessions (5 weeks only). Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Fundamentals of oncology for veterinary students with objectives of clinical practice, research or academic careers. Topics will include etiology, diagnosis, and treatment of cancer in domestic animals.

425A. Cardiopulmonary and Renal Systems—Normal Form and Function (8) III. Bruss
Lecture—56 hours total; laboratory—24 three-hour sessions, (discussion-laboratory sessions flexible). Prerequisite: first-year standing in School of Veterinary Medicine.† Correlated presentation emphasizing anatomical, physiological aspects of the cardiovascular, respiratory and renal systems of common domesticated animals. Homeostatic mechanisms governing body fluids and electrolytes will be included.

425B. Cardiopulmonary, Renal, Abnormal (8) I-II. Ling
Lecture—64 hours total; laboratory—16 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine.† Abnormal function of the circulatory, pulmonary and renal systems and disease affecting these systems in animals. The manifestations, pathology, pathogenesis, diagnosis and medical and surgical treatments of cardiopulmonary-renal disease will be discussed. (Deferred grading only, pending completion of two-quarter sequence.)

426. Principles of Anesthesiology (1.7) III. Steffey
Lecture—15 sessions total; laboratory—2 three-hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine or consent of instructor. Basic principles of veterinary anesthesiology including the techniques, monitoring and management of anesthesia in animal patients, the clinical use of anesthetic drugs and anesthetic equipment.

427. Equine Internal Medicine (3) III. Carlson
Lecture—30 hours total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Advanced equine medical diseases including sections on general medicine, respiratory and gastrointestinal diseases, cardiology, dermatology, neurology, oncology, and ophthalmology.

428. Food Animal Surgery (1.6) II. Smith
Lecture—16 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine. Selected topics in surgical diseases of food animals covered in detail. (S/U grading only.)

428L. Food Animal Surgery Laboratory (0.6) II. Smith
Laboratory—6 three-hour sessions total. Prerequisite: third-year standing in School of Veterinary Medicine; course 428 (concurrently). Representative surgeries of food animals performed by groups of students. Limited enrollment. (S/U grading only.)

429A. Herd Health Management of Beef, Cattle, Swine, Sheep and Goats (4) II. Hjerpe
Lecture—4 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Practical systems for delivering veterinary service to feedlot, cow-calf, stocker, swine, sheep and goat production units are considered, with emphasis on prevention and control of disease.

429B. Dairy Herd Health Management (2) III. Hjerpe
Lecture—2 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Practical systems for delivering veterinary services to dairy farms are considered, with emphasis on prevention and control of disease.

430A. Structure and Function of the Gastrointestinal System (3.5) III. Curry
Lecture—24 sessions total; laboratory—11 sessions total. Prerequisite: first-year standing in School of Veterinary Medicine.† Structure and function of the normal gastrointestinal system, including ruminants, as a basis for understanding the disease process. Emphasis will be placed on integrating morphology and physiology with respect to gastrointestinal secretions, motility, absorption, and allied processes.

430B. Gastrointestinal Diseases: Gastroenterology (Abnormal) (5) II. III. Strombeck
Lecture—5 hours. Prerequisite: second-year standing in School of Veterinary Medicine. Abnormal function of the digestive system and diseases affecting the digestive system in all species of animals. The manifestations, pathology, pathogenesis, diagnosis including special diagnostic procedures, and medical and surgical treatments of gastrointestinal disease including diseases of the liver and pancreas.

431. Metabolism (1.5) II. Black, Freedland
Lecture—15 hours total. Prerequisite: first-year standing in School of Veterinary Medicine.† Interaction of carbohydrate, lipid and protein metabolism with emphasis on physiological control mechanisms in animals; factors affecting metabolic control including hormones, nutrition and development; adaptations involved in homeostasis. Significance of these processes in health and in disease.

433. Avian Medicine (1.6) III. Yamamoto, Lam
Lecture—15 sessions total; one examination period. Prerequisite: second-year standing in School of Veterinary Medicine. Overview of select infectious diseases of poultry including their diagnosis, management and control.

434. Infectious Diseases (5.4) I-II. Ardans
Lecture—54 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine.† An overview of select infectious diseases of companion and food animals including poultry. (Deferred grading only, pending completion of two-quarter course.)

435. Veterinary Hematology (5.5) I-II. Jain
Lecture—32 sessions total; laboratory—23 three-hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine. Hematopoietic system of animals in health and disease: development of the system, regulatory mechanisms, blood and bone marrow cell morphology and function, methods of evaluation, effects of disease upon the sytem and diseases of the system. (Deferred grading only, pending completion of two-quarter course.)

436. Public Health and Food Safety (2) III. Genigeorgis
Lecture—2 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor.† Introduction to preventive aspects of veterinary medicine as they relate to zoonoses, environmental hygiene and the safety of foods of animal origin.

439. Beef Cattle Nutrition (1) III. Hjerpe
Lecture—1 hour. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Economically-sound methods for meeting nutrient requirements of feedlot and pasture beef cattle (including computer-assisted methods). Strategies for presenting nutritional and ration-associated diseases of beef cattle.

440. Endocrine System Normal and Abnormal Structure and Function (2.8) II. Kennedy
Lecture—24 hours total; discussion—3 three-hour sessions; laboratory—1 three-hour session. Prerequisite: second-year standing in School of Veterinary Medicine.† A correlated presentation of the structure and function of the normal and diseased endocrine glands of domesticated animals.

445A. Reproduction (6.6) II, III. Stabenfeldt and staff
Lecture—44 hours total; laboratory—22 hours total. Prerequisite: second-year standing in School of Veterinary Medicine. Course covers structure, function, pathologic and clinical aspects of reproduction (normal and abnormal).

445B. Small Animal Theriogenology (1) III. Feldman
Lecture—12 sessions total. Conditions affecting the reproductive system in the dog and cat, with emphasis on symptomatology, pathophysiology and treatment. Development of diagnostic and therapeutic approaches to the clinical patient will be stressed.

445C. Food Animal Theriogenology (3) II Bon Durant
Lecture—2 hours; laboratory—3 hours. Prerequisite: student in School of Veterinary Medicine. Conditions affecting the reproductive system in the cow, sow, ewe and goat, with emphasis on symptomatology, pathophysiology, treatment, control, prevention, and herd health applications.

445D. Equine Theriogenology (3) II. Hughes
Lecture—2 hours; laboratory—3 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Discussion of special problems of equine reproduction with emphasis on methods of diagnosis and interpretation of clinical and laboratory findings.

450. Immunology (3.3) I, Osebold
Lecture—21 hours total, laboratory—12 two-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. Concepts of immunobiology. Dynamics of infection and resistance. Pathogenetic mechanisms in immunological diseases, allergy, cancer immunology.

451. Veterinary Bacteriology and Mycology (5.7) I, Biberstein, Buchanan, Hirsh
Lecture—37 hours total; laboratory—20 two-and-one-half-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine.† An introduction to the nature of bacteria and fungi, their relation to animal disease, and the methods of diagnosing bacterial and mycotic disease.

452. General Pathology (4.2) I. Moore, Moulton
Lecture—24 sessions total; laboratory—36 sessions total. Prerequisite: second-year standing in School of Veterinary Medicine†. Basic pathologic processes, especially their nature and pathogenesis. Includes degenerative changes, circulatory disturbances, inflammation and repair, abnor-

NOTE: For key to footnote symbols, see page 123.

malities of cell growth and differentiation, and basic immunopathology.

453. Viral Pathogens of Animals (2.6) II. Zee
Lecture—16 hours total; laboratory—10 hours total. Prerequisite: second-year standing in School of Veterinary Medicine.† The biology of infectious diseases caused by viruses. Virus-host relationship with emphasis on pathogenesis, immunity and diagnosis.

455. Integumentary System (4.9) I, Stannard
Lecture—49 hours total. Prerequisite: third-year standing in School of Veterinary Medicine.† Course covers structure, function, pathologic and clinical aspects including therapeutics of the integumentary system and diseases of the integumentary system of animals. (Deferred grading only, pending completion of course.)

456. Jurisprudence and Law for the Veterinarian (2) II. Wilson
Lecture—20 hours total. Prerequisite: third-year standing in School of Veterinary Medicine. Introduction to principles of veterinary medical jurisprudence and legal concepts pertinent to professional activities.

457. Veterinary Business Management (2) II-III. Wilson
Lecture—20 one-hour sessions total (10 weeks). Prerequisite: third- or fourth-year standing in School of Veterinary Medicine or consent of instructor. Course presents a groundwork of information which is essential to the successful management of a veterinary practice. Topics to be covered include basic accounting, medical recordkeeping, money management, business and personal insurance, client relations and tax law. (S/U grading, deferred pending completion of course.)

459. Veterinary Clinical Cytology (1.5) II. Zinkl, Feldman
Lecture—8 one-hour sessions total; laboratory—7 three-hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine or consent of instructor. Cytology of effusions, aspirates, washings and impression smears of organs and tissues having neoplastic, inflammatory and degenerative lesions.

460. Emergency and Critical Patient Care (2) II. Parker
Lecture—20 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine. Introduction to the essential and practical concepts of care for emergency and critically ill patients.

461. Small Animal Orthopedics (1.6) II. Wind
Lecture—14 sessions total; laboratory—2 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine. Surgical approaches to joints of the shoulder, hip, elbow and stifle, and fractures of the humerus, radius ulna, pelvis, femur, and tibia.

462. Radiographic Diagnosis: Small Animal (2.5) III. Gomez
Lecture—25 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine. Diagnostic radiography of small animals for the student electing small animal and mixed tracks. Non-contrast radiology and special procedures will be discussed as they relate to the thorax, abdomen, and musculoskeletal system.

466. Mixed Large-Animal Anesthesiology (1.5) II. Hildebrand
Lecture—15 hours total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor.† Applied clinical anesthesiology for junior veterinary students. Special techniques and consideration for anesthetizing a variety of species including horses, swine, ruminants, large non-domestic species, cats and dogs.

467. Small-Animal Anesthesiology (1.5) II. Haskins
Lecture—15 hours total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor.† Presentation of material which is basic to safe clinical administration of anesthetic drugs to small animals. Clinical applications, indications and contraindications, and methods of use of common anesthetic drugs and techniques will be discussed.

468. Equine Lameness and Radiology (4) III. Meagher, O'Brien, Pool, Lohse
Lecture—4 hours. Prerequisite: third-year standing in School of Veterinary Medicine. Principles in the radiologic diagnosis of conditions that cause lameness in the equine will be emphasized. Methods used in large-animal radiography will be illustrated and latest technique for treating equine lameness will be discussed. Anatomy and pathology of some areas of the musculoskeletal system will also be presented.

468L. Equine Lameness and Radiology (1) III. Meagher, O'Brien, Pool, Lohse
Laboratory—3 hours. Prerequisite: course 468 (concurrently). Priority enrollment for students in equine track; others with consent of instructor. Limited enrollment.

469. Equine Surgery (2) III. Wheat
Lecture—20 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Designed to allow third-year veterinary students additional training and experience with surgical procedures in the horse.

469L. Equine Surgery Laboratory (1) III. Wheat
Laboratory—3 hours. Prerequisite: course 469 (concurrently). Specific surgical procedures of the horse are demonstrated and performed by students. Participants in course work in groups of three on rotating basis. Limited enrollment.

470A-470B-470C. Hospital Practices (2-2-2) I-II-III. The Staff (Director VMTH in charge)
Clinics—8 hours. Prerequisite: third-year standing in School of Veterinary Medicine; open to graduate students. Assignments in the medical and surgical services and clinical diagnostic laboratories of the Veterinary Medical Teaching Hospital. (S/U grading only, pending completion of three-quarter sequence.)

471. General Practice Clinics (2½-15) I-II-III; summer (Sessions I and II) and I, Hjerpe
Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor.† Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of Veterinary Medical Teaching Hospital with equivalent emphasis on small and large animal species. May be repeated for credit. Students in combined DVM/MPVM program enroll for the summer-fall sequence. (S/U grading only, pending completion of three-term sequence.)

472. Urban Practice Clinics (2.5-15) I-II-III. Hjerpe
Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor.† Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of Veterinary Medical Teaching Hospital with emphasis on those services relating to urban veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Session I-II and I sequence. (S/U grading only, pending completion of three-term sequence.)

473. Large Animal Practice Clinics (2.5-15) I-II-III. Hjerpe
Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor.† Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of Veterinary Medical Teaching Hospital with emphasis on those services relating to large animal veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II and I sequence. (S/U grading only, pending completion of three-term sequence.)

474. Equine Practice Clinics (2.5-15) I-II-III. Hjerpe
Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor.† Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of Veterinary Medical Teaching Hospital with emphasis on those services relating to equine veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Session I-II and I sequence. (S/U grading only, pending completion of three-term sequence.)

475. Food Animal Practice Clinics (2.5-15) I-II-III. Hjerpe
Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor.† Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of Veterinary Medical Teaching Hospital with emphasis on those services relating to food animal veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II and I sequence. (S/U grading only, pending completion of three-term sequence.)

476. Zoological Practice Clinics (2.5-15) I-II-III. Hjerpe
Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor.† Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of Veterinary Medical Teaching Hospital with emphasis on those services relating to zoological veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II and I sequence. (S/U grading only, pending completion of three-term sequence.)

480A-480B-480C. First-year Clinic Rounds (1.2) I-II-III. The Staff (Director VMTH in charge)
Discussion—twelve 1½ hour sessions total. Prerequisite: first-year standing in School of Veterinary Medicine. Discussion of selected cases from the clinic. (S/U grading only, pending completion of three-quarter sequence.)

481A-481B-481C. Second-year Clinic Rounds (1.2) I-II-III. The Staff (Director VMTH in charge)
Discussion—twelve 1½ hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine. Discussion of selected cases from the clinic. (S/U grading only, pending completion of three-quarter sequence.)

Veterinary Microbiology and Immunology

(School of Veterinary Medicine)

Yuan Chung Zee, D.V.M., Ph.D., Chairperson of the Department

Department Office, 2075 Haring Hall

Faculty

Alexander A. Ardans, D.V.M., M.S., Professor *(Medicine)*
Norman F. Baker, D.V.M., Ph.D., Professor
Ernst L. Biberstein, D.V.M., Ph.D., Professor
Audria M. Buchanan, Ph.D., Associate Professor
Laurel J. Gershwin, D.V.M., Ph.D., Assistant Professor
Dwight C. Hirsh, D.V.M., Ph.D., Professor
Edmond C. Loomis, Ph.D., Adjunct Lecturer
Delbert G. McKercher, D.V.M., Ph.D., Professor Emeritus
Katharine M. Merritt, Ph.D., Associate Professor *(Orthopaedic Surgery)*
John W. Osebold, D.V.M., Ph.D., Professor
Randall F. Pritchett, Ph.D., Assistant Professor
Moshe Shifrine, Ph.D., Adjunct Professor
Ming Ming Wong, Ph.D., Professor
Yuan Chung Zee, D.V.M., Ph.D., Professor

Courses in Veterinary Microbiology and Immunology

Upper Division Courses

126. Fundamentals of Immunology (3) I, Buchanan, Hirsh
Lecture—3 hours alternate weeks with lecture—2 hours and discussion—1 hour. Prerequisite: Biochemistry 101A or the equivalent. Immune response and defenses of host against infection: antibodies, antigens, antibody-antigen interactions, regulation and manipulation of the immune response, hypersensitivity mechanisms and their relationships to disease processes. Clinical applications of immune phenomena emphasized.

126L. Immunology Laboratory (2) II. Gershwin
Laboratory—6 hours. Prerequisite: course 126. Laboratory procedures in immunology. The immune response to antigens, antigen-antibody interactions, hypersensitivity mechanisms.

127. Medical Bacteria and Fungi (5) III. Biberstein in charge
Lecture—3 hours; laboratory—6 hours. Prerequisite: general microbiology; basic immunology. An introduction to the bacterial and mycotic pathogens of man and animals, with emphasis on pathogenic mechanisms and ecologic aspects of infectious disease. Limited enrollment.

128. Biology of Animal Viruses (3) I, Zee, Pritchett, Manning (Bacteriology)
Lecture—3 hours. Prerequisite: Biochemistry 101A or the equivalent. Fundamental physical and chemical properties of animal viruses; methods of propagation, purification and assay. Mechanisms of viral replication and pathogenesis of viral infections in man and animals. Immunity to virus diseases and oncogenic properties of animal viruses.

132. Introduction to Parasitology (5) III. Wong
Lecture—3 hours; laboratory—6 hours. Prerequisite: Zoology 2-2L. The nomenclature of human and animal parasites, their general morphology, life cycles, epidemiology, diagnostic techniques, and host-parasite relationships. Individual laboratory studies supplemented with demonstrations.

198. Directed Group Study (1-5) I, II, III. The Staff (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.)

NOTE: For key to footnote symbols, see page 123.

Graduate Courses

228. Molecular Biology of Animal Virus (3) II. Pritchett
Lecture—3 hours. Prerequisite: course 128 or Biological Sciences 162 or the equivalent. Current status of molecular biology of the major groups of animal viruses. Topics of major emphasis include: virus genome structure, strategy of genome replication and transcription, and regulation of genome expression.

270. Advanced Immunology (6) III. Osebold, Gershwin
Lecture—3 hours; laboratory—9 hours. Prerequisite: course 126 or Veterinary Medicine 450 or consent of instructor. Immunoglobulin structure and function, antigenic determinants, complement. Biology of lymphocytes: cell-mediated immune reactions, immunogenetics, hypersensitivity. Pathogenetic mechanisms in immunological diseases, immunological unresponsiveness, cancer immunology. Dynamics of infection and resistance. Methods in immunochemistry and immunobiology. Offered in odd-numbered years.

291. Seminar in Immunology (1) I, II, III. Gershwin
Seminar—1 hour. A discussion of the current topics in immunology.

292. Seminar in Animal Virology (1) I, II, III. Zee, Pritchett
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—1 hour. Discussion of current topics and cases of infectious diseases. (S/U grading only.)

294. Seminar in Parasitology (1) III. Baker, Wong
Seminar—1 hour. Discussion of current topics in veterinary parasitology and entomology.

296. Microbiological Diagnosis (2-5) I, II, III. Biberstein, Ardans (Medicine), Gershwin, Hirsh
Discussion—1 hour; laboratory—5-14 hours. Prerequisite: laboratory course in veterinary or medical microbiology or the equivalent; course 293 (concurrently); consent of Chief of Microbiology, VM Teaching Hospital. Lab diagnosis of infectious diseases involving case work at the VM Teaching Hospital. (S/U grading only).

298. Group Study (1-5) I, II, III. The Staff (Zee in charge)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Veterinary Pharmacology and Toxicology

(School of Veterinary Medicine)

J. Desmond Baggot, M.V.M., Ph.D., D.Sc., Acting Chairperson of the Department

Department Office, 2165 Haring Hall (752-1059)

Faculty

J. Demond Baggot, M.V.M., Ph.D., D.Sc., Professor
Gaylord M. Conzelman, Jr., Ph.D., Professor
Shri N. Giri, B.V.Sc., Ph.D., Professor
Robert M. Joy, Ph.D., Associate Professor
Alan A. Seawright, D.V.Sc., Ph.D., Professor
Henry J. Segall, Ph.D., Associate Professor

Courses in Veterinary Pharmacology and Toxicology

Upper Division Course

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

223. Clinical Pharmacokinetics: Concepts and Applications in Comparative Medicine (2) III. Baggot
Lecture—1 hour; discussion—1 hour. Prerequisite: comparative or veterinary physiology and general pharmacology. Concepts of pharmacokinetics. Absorption and disposition of various drugs, which are used as therapeutic agents, will be compared in different species (man and domestic animals). Course will provide background for research in clinical pharmacology.

***253. Drug Metabolism** (2) III. Giri
Lecture—2 hours. Prerequisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B; consent of instructor. General pathways of drug metabolism and factors influencing the drug metabolism. Emphasis laid upon the species, age, and genetic differences affecting the biological disposition of the drugs. Offered in even-numbered years.

258. Drug Receptors (2) III. Joy
Lecture—2 hours. Prerequisite: Pharmacology 200, 201 or the equivalent. Theories of drug-receptor interactions and their application to known receptor systems stressed. Present concepts of adrenergic, cholinergic, opiate, and other receptors considered in conjunction with their functional importance. Offered in odd-numbered years.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in Charge)
Prerequisite: consent of instructor. Group study in selected areas of Pharmacology and Toxicology. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

405. Veterinary Clinical Pharmacology (2) II. Baggot
Lecture—2 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Pharmacological basis of therapeutic use of drugs in domestic animals. Emphasis on selection of most appropriate drug, its dosage form, route of administration and dose for treatment of certain disease conditions. (S/U grading only.)

Viticulture and Enology

(College of Agricultural and Environmental Sciences)

Cornelius S. Ough, D.Sc., Chairperson of the Department

Department Office, 1023 Wickson Hall (752-0380)

Faculty

Maynard A. Amerine, Ph.D., Professor Emeritus
Roger B. Boulton, Ph.D., Associate Professor (Viticulture and Enology, Chemical Engineering)
James A. Cook, Ph.D., Professor Emeritus
Richard E. Kepner, Ph.D., Professor *(Viticulture and Enology, Chemistry)*
W. Mark Kliewer, Ph.D., Professor
Ralph E. Kunkee, Ph.D., Professor
Lloyd A. Lider, Ph.D., Professor Emeritus
Mark A. Matthews, Ph.D., Assistant Professor
Carole P. Meredith, Ph.D., Assistant Professor
Janice C. Morrison, Ph.D., Assistant Professor
Klayton E. Nelson, Ph.D., Professor
Ann C. Noble, Ph.D., Associate Professor
Harold P. Olmo, Ph.D., Professor Emeritus
Cornelius S. Ough, D.Sc., Professor
Dewey D. Y. Ryu, Ph.D., Maynard A. Amerine, Professor of Viticulture and Enology *(Viticulture and Enology, Chemical Engineering)*
Vernon L. Singleton, Ph.D., Professor
Robert J. Weaver, Ph.D., Professor
A. Dinsmoor Webb, Ph.D., Professor Emeritus
Larry E. Williams, Ph.D., Assistant Professor
Albert J. Winkler, Ph.D., L.L.D., Professor Emeritus

The Program of Study. Enology is a specialization within the Fermentation Science major (see page 212). Viticulture is a specialization within the Plant Science major (see page 289).

Related Major Program. See major in Biochemical Engineering (page 181).

Related Courses. See Food Science and Technology 206; Plant Science 112, 112L; and Chemical Engineering 160, 226..

Graduate Study Various graduate groups offer programs of study leading to advanced degrees in the field of viticulture and enology. For the M.S. degree see Agricultural and Environmental Chemistry, Botany, Chemical Engineering, Ecology, Food Science, Genetics, Horticulture, Microbiology, Plant Physiology, and Soil Science. For the Ph.D. degree see Agricultural and Environmental Chemistry, Botany, Chemical Engineering, Ecology, Genetics, Microbiology, Plant Pathology, Plant Physiology, and Soil Science.

Courses in Viticulture and Enology

Lower Division Courses

3. Introduction to Wine Making (3) I, II, III. Kunkee, Singleton
Lecture—2 hours; discussion—1 hour. An introduction to wine technology, including effects of alcohol, history of wine, fermentation, production practices, wine types, and the wine industry of California and other wine producing areas.

35. Fermentation Science (2) III. Ryu, Kunkee, Ogrydziak (Food Science and Technology)
Lecture—2 hours. Prerequisite: Biological Sciences 1. Introductory fermentation science course for undergraduates interested in specializing in a scientific discipline closely related to fermentation science and biotechnology. Topical areas include: applied microbiology, fermentation process development, primary and secondary metabolites, specialty chemicals, gene products, and future perspectives of biotechnology.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Ough in charge)
(P/NP grading only.)

Upper Division Courses

100. Grape Growing (3) I. Weaver, Williams
Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2, Botany 2, or consent of instructor. Grape growing including botany and morphology; distribution and domestication, propagation, varieties and uses, climatic requirements, utilization of the crop, grape regions of the world, production practices, some common diseases and insect pests, and vineyard grape sampling.

105. Systematic Viticulture, Including Fruit Maturation and Handling (3) I. Meredith
Lecture—1½ hours; laboratory—4½ hours. Prerequisite: Plant Science 2. 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. Kliewer
Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2 and consent of instructor. Principles underlying pruning, training, grafting, and propagation of vines; environmental and economic factors affecting choice of vineyard type and location; establishment of vineyards.

116B. General Viticulture (3) III. Kliewer, Matthews
Lecture—2 hours; eight 3-hour laboratory sessions; one Saturday field trip. Prerequisite: course 116A. Economics and scientific principles of recommended vineyard management practices including irrigation, mineral and carbohydrate nutrition, flower development and fruit set, virus and fungal diseases, and insect control.

123. Analysis of Musts and Wines (3) I. Ough
Lecture—2 hours; laboratory—3 hours. Prerequisite: Chemistry 5, 8A, and 8B. Open to undergraduate students in Fermentation Science and Plant Science, and graduate students in Agricultural and Environmental Chemistry, Food Science, Horticulture, and Microbiology. Principles of grapejuice and wine analysis, and the reasons for use of each analysis. Analyses of a practical and useful nature are chosen for the laboratory exercises demonstrating various chemical, physical and biochemical methods.

124. Wine Production (3) I. The Staff (Ryu in charge)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 3, Bacteriology 2, 3, and Biochemistry 101A; course 123 (may be taken concurrently). Open to undergraduate students in Fermentation Science and Plant Science, and graduate students in Agricultural and Environmental Chemistry, Food Science, Horticulture, and Microbiology. Principles and practice of making the various standard types of wines, with special reference to the grape varieties used and the method of vinification required for each.

125. Wine Types and Sensory Evaluation (3) II. Noble
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 124, Agricultural Science and Management 150, and consent of instructor. Open to upper division students in Fermentation Science and Plant Science, and graduate students in Agricultural and Environmental Chemistry, Food Science, Horticulture, and Microbiology; or consent of instructor. Major

NOTE: For key to footnote symbols, see page 123.

types of wines and the factors influencing their quality: principles of sensory evaluation.

126. Wine Processing (3) II. Boulton
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 124. Open to undergraduate students in Fermentation Science and Plant Science, and graduate students in Agricultural and Environmental Chemistry, Food Science, Horticulture, and Microbiology. Principles and theory of acidity adjustments, physical instabilities (metal, tartrate, protein, color, oxidation). The treatment of wines by adsorption, clarification, refrigeration, filtration and ion exchange.

135. Wine Processing Equipment (1) II. Boulton
Lecture—1 hour; field trip. Prerequisite: courses 124, 126; Food Science and Technology 110A, 110B recommended. A course for undergraduates which provides a systematic description of unit operations and processing equipment used in modern commercial winemaking. Emphasis is given to the principles and techniques of operation and to the performance of this equipment with grapes, juices and wines.

140. Distilled Beverage Technology (4) III.
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B, Food Science and Technology 110A, or the equivalent. Distillation principles and practices; production technology of brandy, whiskey, vodka, gin, and other distilled beverages; characteristics of raw materials, fermentation, distillation, and aging; chemical analysis and sensory evaluation.

192. Internship (1-12) I, II, III, summer. The Staff (Ough in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units. Work-learn experience related to Fermentation Science (Enology) or Plant Science (Viticulture) majors. Internships must be approved and supervised by a member of the Department or Major faculty, but are arranged by the student. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III, The Staff (Ough in charge)
(P/NP grading only.)

Graduate Courses

217. Microbiology of Wine Production (3) III. Kunkee
Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 123, 124; Bacteriology 3; Biochemistry 101A; Chemistry 8B. Recommended: courses 125, 126. Nature, development, physiology, biochemistry, and control of yeasts and bacteria involved in the making, aging, and spoilage of wines.

219. Plant Phenolics (3) II. Singleton
Lecture—3 hours. Prerequisite: Biochemistry 101B or the equivalent and consent of instructor. Flavonoids and other natural phenolic substances of plants; their chemistry, natural occurrence, biochemistry, relation to animal diets, and relation to properties of foods and other products.

235. Winery Design and Economics (2) II. Boulton
Lecture—3 hours; 4 design classes; field trip. Prerequisite: course 135, Food Science and Technology 110A-110B, and Computer Science Engineering 20 or Engineering 5. Specialization in the design and economic evaluation of modern commercial wineries. Emphasis is given to the design of new wineries and the interaction of size, grape and bottle prices on the economic feasibility of the venture. (Offered in odd-numbered years.)

290. Seminar (1) II, III. Morrison
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III Research Faculty
Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Planning and results of research programs, proposals, and experiments. Discussion and critical evaluation of original research being conducted by the group. Discussion led by individual research instructors for research group. May be repeated for credit. (S/U grading only.)

291. Advances in Viticulture (1) II. Weaver
Seminar—1 hour. Prerequisite: consent of instructor. Experts in various fields of Viticulture will lead discussions on recent advances in their fields of expertise. Emphasis and topics will vary from year to year and course may be repeated for credit. (S/U grading only.)

292. Advances in Enology (1) III. Kunkee
Discussion—1½ hours, seven to ten weeks. Prerequisite: courses 123, 124, 125, 126. Discussions of previously assigned reading material, usually in the form of two to three reprints. Discussions led by staff enologists to acquaint students with their current research interests. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III The Staff (Ough in charge) (S/U grading only.)

299. Research (1-12) I, II, III The Staff (Ough 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.

Related Major Program. See the major in Soil and Water Science, page 308.

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 94

Graduate Adviser. W. O. Pruitt. *(Land, Air and Water Resources).*

Courses in Water Science

Questions pertaining to the following courses should be directed to the instructor or to the Resource Sciences Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

10. Water and Society (3) III Hagan
Lecture—3 hours. Water as a factor in society and the environment. Water issues and policies. Water supply and utilization problems of agriculture, domestic, industrial and other water users in developed and developing nations. Introduction to water resources science engineering.

41. Ecology of Polluted Waters (3) II Knight
Lecture—3 hours. Prerequisite: Biological Sciences 1 or the equivalent. Causes and nature of various types of pollution and their effects upon aquatic biota. Particular emphasis on biological effects of toxic compounds, inorganic compounds, suspended matter, organic matter, salts and heated water on aquatic life.

92. Water Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in water science. Internship supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Principles of Water Science (4) II. Silk
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A, Physics 2A, and Botany 2 or Plant Science 2; Chemistry 1B and Physics 2B recommended. Introduction to scientific principles as applied to water and water problems. Topics include hydrology (surface and ground water), flow through porous media, water in soil-plant-atmosphere continuum, water quality, flow through pipes and channels, and representative water-resource problems.

103. Water Quality, Salt Control and Reclamation (4) I, Biggar
Lecture—3 hours; laboratory—3 hours. Prerequisite: course in soil or water chemistry or consent of instructor. Water quality parameters, water analysis and salinity control in relation to soil and plant factors; reclamation of soil and disposal of waste water and their effects on receiving waters; localized and regional river basin problems in relation to salinity control and water quality.

104. Plant-Water-Soil Relationships (4) III. Hsiao
Lecture—3 hours; discussion—1 hour; two mid-quarter examinations to be arranged. Prerequisite: course 100 or the equivalent preparation in elements of water in soil and plants, Soil Science 100 and one additional course in soils or plant physiology; or consent of instructor. Principles of plant interactions with soil and water environments and their applications in crop and environmental management. Including nutrient and water uptake and transport; transpiration; soil processes affecting supplies; deficiencies and plant responses.

110. 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.

111. Introduction to Irrigation Systems (3) I, Pruitt
Lecture—2 hours; laboratory—3 hours. Prerequisite: Physics 2B or the equivalent. General course for Agricultural and Engineering students introducing irrigation systems, descriptions and design appreciation. Laboratory exercises include field evaluation of surface, sprinkler and trickle irrigation, water measurement and pump performance.

122. Biology of Running Waters (3) I, Knight
Lecture—2 hours; discussion—1 hour. Prerequisite: introductory course in biology and junior standing. The study of aquatic animals and plants in relation to their environment; various factors affecting the distribution of freshwater plants and animals is emphasized in a manner particularly suitable for students of freshwater ecology, soil and water science, and renewable natural resources.

122L. Biology of Running Waters Laboratory (2) I, Knight
Laboratory—2 hours (including 2 or 3 weekend field trips). Prerequisite: introductory course in biology or consent of instructor and junior standing; course 122 (concurrently). Course allows interested students to obtain experience in sampling, processing, and synthesizing field data. Field trips will allow students to obtain an understanding of the structure and function of stream ecosystems.

140. Seepage and Drainage (3) III. Hansen
Lecture—3 hours. Prerequisite: Engineering 103A or course 142. Flow through porous media; measurement of hydraulic conductivity; seepage under hydraulic structures; anisotrophy flow nets, drainage design for water table and salt control. (Same course as Engineering: Agricultural 140.)

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.

142. Hydraulics (3) III. Scott, Burgy
Lecture—2 hours; laboratory-discussion—3 hours. Prerequisite: Physics 2A; course 100 recommended. An introductory course for non-engineers. Physical properties of water; fluid statics; principles and equations of flow, continuity, and conservation; flow in pipes and open channels, flow measurements; and pump performance and selection.

149. Groundwater Hydrology (3) I, Mariño
Lecture—3 hours. Prerequisite: Mathematics 16A-16B and course 100; course 142 or Engineering 103A recommended. Occurrence, distribution, and movement of groundwater. Steady and transient groundwater-flow systems. Aquifer tests. Well construction, operation, and maintenance. Groundwater exploration, quality, and contamination. Offered in even-numbered years.

150. Water Law and Water Institutions (3) II. Schneider
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. Surface Water Application Systems (3) II. Wallender
Lecture—3 hours. Prerequisite: courses 110, 111, 142, and Mathematics 16B. Application of physical and engineering principles to design, construction, operation and maintenance of surface irrigation systems, including planning for on-the-farm land leveling and water delivery.

170. Field Studies in Irrigation and Drainage Management (1)
Extra-session summer. Robinson in charge.
Discussions and field observations—7 days. Prerequisite: senior standing in Soil and Water Science or Engineering or consent of instructor. Field observations and discussions on irrigation and drainage systems in the San Joaquin Valley.

172. Farm Irrigation Management (3) III. Henderson
Lecture—3 hours; one field trip. Prerequisite: course 104 or 110, or consent of instructor. The water budget is used as a means of orderly analysis of plant, soil, climatic, systems, and operational factors to develop a rationale for farm irrigation practices. Plant and soil factors are emphasized.

180. Chemistry of the Hydrosphere (3) III. Tanji
Lecture—3 hours. Prerequisite: Chemistry 5 and introductory courses in geology, soils, hydrology or limnology. To provide an understanding of various mechanisms and processes regulating the chemistry of natural waters. Linkage between hydrologic and geochemical cycles is stressed. Covered are chemical characteristics of rainwater and snow, streams and rivers, lakes, ground waters, estuaries, and oceans.

192. Water Science Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units

NOTE: For key to footnote symbols, see page 123

and consent of instructor. Work-learn experience off and on campus in water science. Internship supervised by a member of the faculty. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: senior standing. (P/NP grading only.)

Graduate Courses

200. Water-Soil-Plant Relationships in Irrigation Programming (3) III. The Staff
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 111A; 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 20-20L or 105, or consent of instructor. Radiation and energy balances of water, soil and vegetative surfaces and the effects of wind; temperature, humidity thereon. Lysimeter and other measurement techniques. Prediction of evapotranspiration from aerodynamic, energy balance, and empirical approaches.

205. Water-Resource Systems Analysis: Deterministic Models (3) I. Mariño
Lecture—3 hours. Prerequisite: Mathematics 22A or consent of instructor; course 141 or the equivalent. Applications of deterministic linear and dynamic programming techniques to water-resource systems design. Allocation of aqueduct and reservoir capacities, conjunctive surface and groundwater systems. Sequencing of water supply projects.

207. Water-Resource Systems Analysis: Stochastic Models (3) I. Mariño
Lecture—3 hours. Prerequisite: course 205 and Statistics 131A, or consent of instructor. Applications of stochastic linear and dynamic programming, Markov chains, and inventory theory to water-resource systems design. Design and operating policy models of reservoirs. Water quality management models. Offered in odd-numbered years.

215. Advanced Topics in Water and Soil Chemistry (3) II Biggar
Lecture—3 hours. Prerequisite: course in physical chemistry and soil chemistry or consent of instructor. Advanced course in water chemistry emphasizing principles governing interactions of ionic constituents in water with sediment and soils. Topics include electro-kinetic properties of clays, membrane phenomena, rate processes and thermodynamic applications to the water soil system. Offered in odd-numbered years.

217. Hydrochemical Models (3) II Tanji
Lecture—2 hours; laboratory—3 hours. Prerequisite: physical chemistry, calculus and computer programming or consent of instructor. Mathematical and computer modeling of chemical state variables and terrestrial and aquatic systems. Equilibrium and rate models; transport models; systems assessment and simulations.

222. The Biology of Streams (5) III Knight
Discussion—2 hours; seminar—1 hour; laboratory—6 hours (includes field trips). Prerequisite: courses in aquatic entomology, limnology, and phycology. Course will relate various environmental factors to the ecology and productivity of flowing freshwater systems. Emphasis is placed on relationships between stream organisms and their environment by means of integrated field and lecture activities. Offered in even-numbered years.

250. Advanced Soil Physics (3) III. Nielsen
Lecture—3 hours. Prerequisite: Mathematics 22B or consent of instructor; Soil Science 107 and 207 recommended. Theoretical and applied aspects of the simultaneous transport and retention of water, solutes, heat, and gases in unsaturated soils. Miscible and immiscible displacement theories. Emphasis given to current soil physics research topics of general interest in soil, water and engineering sciences Offered in even-numbered years.

290. Seminar (1) II. Knight
Seminar—1 hour. Prerequisite: graduate standing Critical review of relevant water quality problems and recent water quality research and literature.

291. Seminar in Water-Soil-Plant Relations and Irrigation (1) I, II, III. Henderson, Silk, Hsiao
Seminar—1 hour. Prerequisite: graduate standing and background in water-soil-plant relations. Informal presentation on current developments in water-soil-plant relations, plant water use, and irrigation management. Associated discussion analyzes research approaches and techniques and data interpretations. (S/U grading only.)

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.)

Water Science (A Graduate Group)

Verne H. Scott, Ph.D., Chairperson of the Group (752-0690)

Group Office, 122 Hoagland Hall (752-1669)

Faculty. The Group includes faculty from four departments in three colleges and schools, in the areas of hydrology, hydrogeology, water quality, irrigation, drainage, plant physiology, soil and atmospheric sciences, and other disciplines.

Graduate Study. The Graduate Group in Water Science offers the M.S. degree in five broad areas of specialization: (1) hydrology, (2) irrigation and drainage, (3) water quality and pollution, (4) water resources management, and (5) biometeorology. These options focus on either the physical, chemical and biological processes that interact within water systems or on the integrated behavior of water systems as a whole.

Preparation. Students may enter this program with undergraduate training in biology, mathematics, chemistry, physics, soils, engineering or related areas. The curriculum consists of core courses in hydrology, fluid flow, hydrochemistry, hydrobiology and social and economic aspects of water.

Graduate Adviser. W. O. Pruitt (Land, Air and Water Resources), Temporary Building 125 (752-1833).

Related Courses. Many departments, on campus offer courses which are appropriate for programs of study. The principle departments are Land, Air and Water Resources, Civil Engineering, Agricultural Engineering, Environmental Studies, Botany, Agricultural Economics and others. A list of courses is available at the Group Office.

Wildlife and Fisheries Biology

(College of Agricultural and Environmental Sciences)

Peter B. Moyle, Chairperson of the Division

Division Office, 66 Briggs Hall (752-6586)

Faculty

Daniel W. Anderson, Ph.D., Professor
Louis W. Botsford, Ph.D., Assistant Professor
Joseph J. Cech, Jr., Ph.D., Associate Professor
Ronald E. Cole, B.S., Adjunct Lecturer
Walter E. Howard, Ph.D., Professor
Nadine K. Jacobsen, Ph.D., Associate Professor
Dale F. Lott, Ph.D., Professor
Rex E. Marsh, A.B., Adjunct Lecturer
Peter B. Moyle, Ph.D., Professor
Dennis G. Raveling, Ph.D., Professor
Robert G. Schwab, Ph.D., Associate Professor

The Major Program

The Wildlife and Fisheries Biology major deals with the relationships among the needs of man and the requirements of wildlife (including fishes). Understanding these relationships is vital for the maintenance of ecological diversity, recreational resources, and food supplies for future generations. 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. A third wildlife problem is the optimal management of recreational or commercial harvests.

Because of the diversity of problems in the field, emphasis in the major is placed on broad training in biological and physical sciences, with specialization in wildlife or fisheries. The major is designed primarily for students interested in eventually becoming professionals in wildlife and fisheries biology, but its breadth of course requirements, when combined with suitable electives, also make it suitable as a preparatory major for such areas as veterinary medicine and secondary school teaching. Certification by professional societies such as the Wildlife Society, American Fisheries Society, or the Ecological Society of America or preparation for specialized resource-related graduate studies may also be achieved by careful planning of electives with a faculty adviser.

Graduate training in the Division of Wildlife and Fisheries Biology leads to M.S.or Ph.D. degrees in such disciplinary fields as Ecology, Physiology, Applied Mathematics, International Agricultural Development, and Animal Behavior under the supervision of a Wildlife and Fisheries Biology faculty member

Positions now held by graduates in this major include wildlife, fisheries, animal control, and resource biologists and managers with local, state and federal agencies. Some graduates are biologists or consultants with private industries such as commercial fishing businesses, electrical utilities, sportsman's clubs, aquaculture operations, and environmental consulting firms. Also, some are veterinarians, medical physicians, and professors/researchers who teach and/or conduct research in academic institutions. Most of these positions have been attained after further study and relevant experience.

Wildlife and Fisheries Biology

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable.*(Courses shown without parentheses are required.)*

	UNITS
Preparatory Subject Matter	**54**
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Computer science (Computer Science Engineering 20 or Engineering 5)	3
Mathematics (Mathematics 16A, 16B)	6
Physics (Physics 2A, 2B, 2C)	9
Statistics (Statistics 13, 102, or Agricultural Science and Management 150)	4
Zoology (Zoology 2-2L)	6
Depth Subject Matter	**25-31**
Chemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B)	6-7
Ecology (Environmental Studies 100, Entomology 104, or Zoology 125)	3-4
Genetics (Genetics 120 or 100A-100B)	4-6
Physiology (Physiology 110)	5
Vertebrate anatomy (Zoology 105 or 106-106P)	4-5
Evolution (Zoology 148, 149, Genetics 103)	3-4
Breadth Subject Matter	**20**
English 1 and Rhetoric 1 or the equivalent	8

NOTE: For key to footnote symbols, see page 123

Social sciences and humanities† 12

Courses in the Major **13**
Wildlife and Fisheries Biology 122, 130, 140 13

Additional Courses (select Plan I or Plan II)

Plan I: Wildlife Biology specialization **25-26**
Botany (Botany 102 or 108, 117) 9
Statistics, one upper division course 3-4
Wildlife biology (Wildlife and Fisheries Biology 100, 110, 111, 111L) 13

Plan II: Fisheries Biology specialization **26-32**
Aquatic entomology/invertebrate zoology (Entomology 116 or Zoology 112 with adviser's approval) 3-6
Fisheries biology (Wildlife and Fisheries Biology 102, 120, 121) 14
Limnology/oceanography/stream biology (Environmental Studies 116 or 150C or 151 or Water Science 122) 3-4
Statistics, upper division courses 6-9

Unrestricted Electives ..... **(variable)**

Total Units for the Major (minimum) 180

Major Adviser. R.G.Schwab.

Graduate Study. See page 94.

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 Courses

10. Wildlife Biology (4) I. The Staff
Lecture—4 hours. Prerequisite: Biological Sciences 1 recommended. Introduction to the biology and ecology of aquatic and terrestrial wildlife, and basic principles of management.

92. Internship (1-6) I, II, III. The Staff (Department Chairperson in charge)
Laboratory—3-18 hours. Prerequisite: lower division standing and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the department. Internships supervised by a member of the faculty. (P/NP grading only.)

Upper Division Courses

100. Field Methods in Wildlife Biology (3) III. The Staff
Lecture—10 hours total; laboratory—40 hours total (5 days). Prerequisite: course 110 or 111-111L; Zoology 125 or the equivalent; consent of instructor. Intensive course on methods of studying and reporting data obtained from free-ranging wildlife. Held between winter and spring quarters; considered a spring course for preenrollment. Limited enrollment. (P/NP grading only.)

102. Field Studies in Fisheries Biology (6) Extra-session summer. Moyle, Cech
Discussion—1 hour; laboratory—40-60 hours. Prerequisite: upper division course each in ecology and fish biology; consent of instructor. Special session course emphasizes field investigations in fisheries biology including capture methods and individual research projects on ecology, behavior, physiology, or population biology of fishes at the field site in relation to their habitats. Offered in even-numbered years.

110. Mammalian Biology and Ecology (5) III. Schwab
Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: Biological Sciences 1, Botany 2, and Zoology 2-2L, or the equivalent; course in ecology recommended. Integrated introduction to the biology and ecology of nondomestic mammals. Emphasis on natural history, taxonomy, geographical-ecological distribution, anatomical-physiological-behavioral adaptations of mammals to their environment, and research-management methodologies.

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. Students who have had Zoology 137 may not receive credit for this course.

111L. Laboratory in Biology and Management of Wild Birds (2) I, Anderson, Raveling
Laboratory—6 hours. Prerequisite: course 111 (may be taken concurrently); consent of instructor. Laboratory exercises in bird species identification, anatomy, molts, age and sex, specialized adaptations, behavior, and research and management techniques.

120. Biology of Fish (3) I, Moyle
Lecture—3 hours. Prerequisite: Zoology 2 and 2L. Introduction to ecology, morphology, evolution, and systematics of fishes and their relationship to fisheries management.

120L. Biology of Fish Laboratory (1) I, Moyle
Laboratory—3 hours. Prerequisite: course 120 (may be taken concurrently). Laboratory exercises in the morphology, systematics, and identification of fishes, emphasizing the freshwater and marine fishes of California.

121. Physiology of Fishes (4) II. Cech
Lecture—3 hours; laboratory—3 hours. Prerequisite: upper division courses in nutrition and physiology or consent of instructor. Comparative physiology, growth, reproduction, behavior, and energy relations of fishes.

122. Population Dynamics and Estimation (4) III. Botsford
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A-16B; Statistics 13 or the equivalent; an upper division course in ecology. Description of bird, mammal and fish population dynamics, modeling philosophy, techniques for estimation of animal abundance (e.g., mark-recapture, change-in-ratio, etc.), mathematical models of populations (e.g., Leslie matrix, logistic, dynamic pool, stock-recruitment); case histories.

130. Physiological Ecology of Wildlife (5) I, Jacobsen
Lecture—4 hours; discussion—1 hour. Prerequisite: course 110 or 111 or 120; Physiology 110 and Zoology 125 or the equivalent. A study of animal functions, adaptations, and ecological energetics of wildlife. Nutrition metabolism, thermoregulation, and productivity are emphasized as a pattern of relationships for understanding the distribution and abundance of wildlife in time and space.

136. Ecology of Waterfowl and Game Birds (3) II. Raveling
Lecture—2 hours; laboratory—3 hours; field trip. Prerequisite: courses 111 and 111L or the equivalent. Detailed examination of distribution, behavior, population dynamics, and management of waterfowl and upland game birds. Offered in even-numbered years.

140. Ecology and Evolution of Vertebrate Social Organization (4) II. Lott
Lecture—4 hours. Prerequisite: Zoology 2 and upper division ecology (Zoology 125 or the equivalent). Spacing, competition, cooperation, leadership, and grouping of wild vertebrates are described and analyzed as adaptive products of their evolutionary history and ecology. Minimal consideration is given to man and the other primates.

151. Wildlife Ecology (3) I, Howard
Lecture—3 hours. Consideration of the ecology of wildlife species in man-disturbed environments, including ecological aspects of wild vertebrates in relation to reforestation, range management, and pollution; the relationship of wildlife to recreation and wildlands; and resource conservation in the human ecosystem.

152. Principles of Vertebrate Control (3) I, Howard
Lecture—3 hours. Prerequisite: course 151 recommended. The philosophical, historical, ecological, behavioral, and economical basis for regulating population levels of species of terrestrial vertebrates found throughout the world.

153. Wildlife in Polluted Environments (3) II. Anderson
Lecture—3 hours. Prerequisite: introductory courses in organic chemistry, ecology, statistics, and physiology; or consent of instructor. Environmental pollution in relation to vertebrate ecology, studies of the effects and mechanisms of various forms of pollution, review of instances of pollution-wildlife interaction, the ecological consequences, effects on individuals, philosophical considerations. Offered odd-numbered years.

190. Proseminar in Wildlife and Fisheries Biology (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: upper division standing in biological sciences or consent of instructor. Reports and discussions of recent advances related to wildlife and fisheries biology. May be repeated twice for credit. (P/NP grading only.)

190C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: advanced standing; consent of instructor. Weekly conference on research problems, progress and techniques in wildlife and fisheries biology. May be repeated for credit. (P/NP grading only.)

191. Museum Science (2) II. Cole
Lecture—1 hour; laboratory—3 hours. Prerequisite: upper division standing and consent of instructor. Provides the student of biological sciences with principles and methods required to preserve and present biological specimens for research and teaching collections and museums. (P/NP grading only.)

192. Internship (1-12) I, II, III, summer. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the department. Internships supervised by a member of the faculty. (P/NP grading only.)

197T. Tutoring in Wildlife and Fisheries (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: major in Wildlife and Fisheries Biology and consent of instructor. Experience in teaching under guidance of faculty member. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Field Research in Wildlife Biology (6) Extra-session summer. The staff
Lecture—1 hour; laboratory—40 hours; individual research projects and oral and written reports. Prerequisite: courses 140, 110 or 111-111L, Zoology 125, Statistics 102, or the equivalent; consent of instructor. Field research in wildlife biology; formulation of testable hypotheses, experimental design, execution of the study, data reduction, and preparation of suitable written and oral reports. Limited enrollment. (S /U grading only.) Preference given to graduate students in wildlife areas of study.

222. Advanced Population Dynamics (3) II. Botsford
Lecture—3 hours. Prerequisite: graduate standing; advanced course in ecology (e.g., Zoology 125), population dynamics (e.g., course 122), and one year of calculus; familiarity with matrix algebra and partial differential equations recommended. Logical basis for population models, evaluation of simple ecological models, current population models with age, size, and stage structure, theoretical basis for management and exemplary case histories. Emphasis on development and use of realistic population models in ecological research.

290. Seminar (1-3) I, II, III. The Staff (Chairperson in charge)
Seminar—1-3 hours. Prerequisite: consent of instructor. Seminar devoted to a highly specific research topic in any area of wildlife or fisheries biology. Special topic selected for a quarter will vary depending on interests of instructor and students. (S/U grading only)

290C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference on research problems, progress and techniques in wildlife and fishery sciences. May be repeated for credit. (S/U grading only.)

292. Physiology of Fishes Seminar (1) I, Cech
Seminar—1 hour. Prerequisite: graduate standing and at least two courses in physiology; consent of instructor. Seminar devoted to current topics concerning the physiological functioning of fishes. May be repeated three times for credit. (S/U grading only.)

297T. Supervised Teaching in Wildlife and Fisheries Biology (1–3) I, II, III. The Staff
Tutorial—3–9 hours. Prerequisite: meet qualifications for teaching assistant; graduate standing; and consent of instructor. Tutoring and teaching students in undergraduate courses in Wildlife and Fisheries Biology. Weekly conferences with instructor; evaluations of teaching; preparing for and conducting demonstrations, laboratories, and discussions; preparing and grading examinations. May be repeated for a total of 6 units when a different course is tutored. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Lectures and/or discussions—1-5 hours.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Women's Studies Program

(College of Letters and Science)

Stephanie A. Shields, Ph.D., Program Director

Program Office, Women's Resources and Research Center, 10 Lower Freeborn Hall (752-3307/3372)

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

NOTE: For key to footnote symbols, see page 123.

Committee in Charge

Virginia H. Bennett, Ph.D. *(Russian)*
Lyn H. Lofland, Ph.D. *(Sociology)*
Karen E. Paige, Ph.D. *(Psychology)*
Stephanie A. Shields, Ph.D. *(Psychology)*
Evelyn M. Silvia, Ph.D. *(Mathematics)*

Faculty

Virginia H. Bennett, Ph.D., Assistant Professor *(Russian)*
William M. Bowsky, Ph.D., Professor *(History)*
Cynthia L. Brantley, Ph.D., Associate Professor *(History)*
Susan Crockenberg, Ph.D., Associate Profesor *(Applied Behavioral Sciences)*
Joanne Feit Diehl, Ph.D., Associate Professor *(English)*
Jack D. Forbes, Ph.D., Professor *(Anthropology, Applied Behavioral Sciences)*
Sandra M. Gilbert, Ph.D., Professor *(English)*
Sarah V. Hutchison, M.Ed., Lecturer *(Applied Behavioral Sciences)*
Suad Joseph, Ph.D., Associate Professor *(Anthropology)*
Jacquelyn Mitchell, Ed.D., Assistant Professor *(Afro-American Studies, Applied Behavioral Sciences)*
Karen E. Paige, Ph.D., Associate Professor *(Psychology)*
Don C. Price, Ph.D., Professor *(History)*
Ruth E. Rosen, Ph.D., Associate Professor *(History)*
Barbara Sommer, Ph.D., Lecturer *(Psychology)*
Susan B. Shimanoff, Ph.D., Assistant Professor *(Rhetoric)*
Adaljiza Sosa-Riddell, Ph.D., Lecturer *(Chicano Studies)*
[2,3]Judith Stacey, Ph.D., Associate Professor *(Sociology)*
Lenora A. Timm, Ph.D., Associate Professor *(Linguistics)*
[2,4]Marian B. Ury, Ph.D., Associate Professor *(Comparative Literature)*

The Major Program

"What do women want?" asked Sigmund Freud more than half a century ago, but the famous psychoanalyst couldn't answer his own question. Today, however, he could take a course in Women's Studies and begin to outline some tentative solutions to the problem that the situation of the so-called "second sex" seemed to him to pose. For Women's Studies is a new field devoted to just the kinds of issues that puzzled Freud as well as many of his contemporaries and precursors.

From the Greek philosopher Aristotle to the Enlightenment feminist Mary Wollstonecraft, from the German romantic poet Johann Wolfgang von Goethe to the contemporary French theorist Simone de Beauvoir, important thinkers have speculated about the nature and position of woman, and about the relations between the sexes. Aristotle misogynistically claimed that femaleness was a "defect" of nature, whereas Wollstonecraft demanded education and liberation for women, insisting on female equality. Goethe sentimentally believed that the "eternal feminine" should be a model of "selflessness and purity of heart," while de Beauvoir wrote an eight-hundred page treatise on the problems and prospects of *The Second Sex*. Even de Beauvoir and Wollstonecraft, however, were analyzing only certain aspects of their subject and, like many other feminists in the past, neither could establish the "truth" about women because, of course, there was (and is) no one "truth."

Now, though, scholars from many disciplines have come together to pool their knowledge about many aspects of the female experience and explore many truths about women. Examining women's artistic and intellectual achievements, women's political and sociocultural history, and women's ways of living in cultures and societies all over the world—subjects that students and teachers at universities have almost never seriously researched before—these scholars have begun to define the ways in which the pressures of femaleness (and maleness) have affected not only women's (and men's) cultural achievements, but also the historic events and socioeconomic structures in which both sexes participate.

Thus, the interdepartmental major in Women's Studies explores the ways in which, especially for women, but also for men, gender has affected cultural achievements, historical events and socioeconomic structures. Students majoring in this field may take courses in Afro-American studies, American studies, anthropology, comparative literature, English, history, linguistics, Mexican-American (Chicano) studies, political science, psychology, Russian, sociology, Asian American studies, human development, Native American studies, and other related disciplines. Depending on individual career goals, each student will design a program in consultation with an adviser.

Career Alternatives. Preprofessional students who major in Women's Studies will discover that it offers useful undergraduate training for schools of medicine and law, particularly, in medicine, for specialties in obstetrics/gynecology, family practice, pediatrics or psychiatry; and in law, for special ties in social or family related issues. In addition, students who plan to do practical work in counseling, clinical psychology, social services or political science will find Women's Studies a helpful undergraduate major, while more theoretically inclined students who wish to go on to graduate research in such fields as literature, philosophy, sociology, anthropology, psychology, economics or political science will benefit from a strong undergraduate background in women's studies. Increasingly, too, specialists in this field are being used as consultants in industry, higher education, insurance companies and personnel firms. Lately, moreover, state and federal government agencies require people who have special training in understanding the problems that women face in society. Finally, educational institutions need specialists to develop and administer women's studies programs, women's centers, and other institutional structures designed specifically to study and assist women.

Women's Studies

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**20-33**
History 72A	4
Women's Studies 50	4
All the preparatory requirements listed for a discipline in area of student's interest (i.e., American studies, anthropology, economics, English, history, philosophy, political science, psychology, sociology) chosen in consultation with adviser	12-25
Depth Subject Matter	**44**
Two-quarter senior seminar	8
At least 36 upper division units to be chosen with consent of adviser including at least 8 units from Area A, at least 12 units from Area B, and up to 16 units of special topic courses	36
Area A: Women and the Humanities — Comparative Literature 135, 159C, English 155B, 185, Linguistics 113, Russian 121.	8
Area B: Gender and Society — Afro-American Studies 123, 133, American Studies 101B, Anthropology 104, 130, Asian American Studies 112, Chicano Studies 102, Human Development 110, Native American Studies 180, Political Science 166, Psychology 149, Sociology 131, 132, 133.	12
Special topic courses (List of acceptable courses offered throughout the University, will be available from major advisers.)	(maximum) 16
Total Units for the Major	**64-77**

Recommended

The following courses are recommended: American Studies 1F, Biological Sciences 10, Economics 151B, Genetics 10, History 72B, Physiology 10.

Minor Program Requirements:

	UNITS
Women's Studies	**24**
Women's Studies 50	4
Upper division units in women's studies area with courses to be chosen in consultation with adviser — At least 4 units must be from Area A (above) and 8 units from Area B (above). Remaining courses may be elected from Area A and/or B, and/or from relevant special topic courses in the field (current list is available from Women's Studies advisers).	20

Major Adviser. See *Class Schedule and Room Directory.*

Courses in Women's Studies

Lower Division Course

50. Introduction to Women's Studies (4) II, III. The Staff
Lecture—3 hours; discussion—1 hour or term paper (instructor's option). Interdisciplinary introduction which will survey and integrate literary, anthropological, psychological, historical, sociological and biological perspectives on the study of sex roles.

Upper Division Courses

190A. Senior Research Seminar I (4) II. The Staff
Seminar—4 hours. Prerequisite: twenty units in Women's Studies and consent of instructor. Guided reading, discussion, and writing, culminating in the preparation of a research proposal.

190B. Senior Research Seminar II (4) III. The Staff
Seminar—4 hours. Prerequisite: course 190A. Completion of individual research project formulated in course 190A; seminar discussion of topics and problems related to individual projects

192. Internship in Women's Studies (1-12) I, II, III. The Staff
Work-learn experience—3-36 hours; written report. Prerequisite: completion of a minimum of 84 units and consent of instructor; enrollment dependent on availability of intern positions with priority to Women's Studies majors. Supervised internship and study in positions/institutional settings dealing with gender-related problems or issues, as for example, a women's center, affirmative action office, advertising agency, or social welfare agency. Final written report on internship experience. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Director in charge)
Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

Work-Learn Program

Orville E. Thompson, Ph.D., Director

Learn and Career Planning and Placement
2nd Floor, South Hall (752-2855)

Program Areas

Agricultural and Environmental Sciences
Joe J. Stasulat, Program Manager

Education and Graduate Placement
Carolyn Walker, Program Manager

NOTE: For key to footnote symbols, see page 123.

Engineering and Physical Sciences
Pamela Heid, Program Manager

Health and Biological Sciences
Linda R. Hughes, Program Manager

Liberal Arts
Donald J. Hagerty, Program Coordinator

Internship Experience

Work-Learn and Career Planning and Placement facilitates a campus-wide internship program. All internships, both credit and non-credit, can be taken for *Transcript Notation* with completion of a required evaluation report. The notation briefly describes the nature and location of the internship experience. Questions pertaining to academic credit and Transcript Notation may be directed to the Work-Learn and Career Planning and Placement Office.

Course Credit. Internship courses (numbered 92 and 192) are available for credit on a variable-unit and Passed/Not Passed grading basis. A maximum of 12 units of 92 and/or 192 courses may be counted toward the 180-unit minimum needed for graduation. To qualify for the 192 course, students must have acquired 84 units of credit. All credited internships require approval and sponsorship by a faculty member from an appropriate discipline. Arrangements may be made through the department of the sponsoring faculty member and facilitated by Work-Learn staff.

Zoology

(College of Letters and Science)

David W. Deamer, Ph.D., Chairperson of the Department
Arthur M. Shapiro, Ph.D., Vice-Chairperson of the Department

Department Office, 2320 Storer Hall (752-1272)

Faculty

Peter B. Armstrong, Ph.D., Professor
Ronald J. Baskin, Ph.D., Professor *(Zoology, Physiology)*
John H. Crowe, Ph.D., Professor
David W. Deamer, Ph.D., Professor
Carol A. Erickson, Ph.D., Assistant Professor
[3,4]Robert D. Grey, Ph.D., Professor
Richard K. Grosberg, Ph.D., Assistant Professor
Milton Hildebrand, Ph.D., Professor
Everett W. Jameson, Jr., Ph.D., Professor
Milton A. Miller, Ph.D., Professor Emeritus
Brian Mulloney, Ph.D., Professor
Richard L. Nuccitelli, Ph.D., Assistant Professor
James F. Quinn, Ph.D., Assistant Professor *(Zoology, Environmental Studies)*
Lauren E. Rosenberg, Ph.D., Professor Emeritus
Robert L. Rudd, Ph.D., Professor
[3,4]George W. Salt, Ph.D., Professor
Thomas W. Schoener, Ph.D., Professor
Arthur M. Shapiro, Ph.D., Professor
Herman T. Spieth, Ph.D., Professor Emeritus
Judy Stamps, Ph.D., Associate Professor
Catherine A. Toft, Ph.D., Assistant Professor (Zoology, Entomology)
Charles van Riper III, Ph.D., Adjunct Assistant Professor
Kenneth E. F. Watt, Ph.D., LL.D., Professor
Martin Wilson, Ph.D., Assistant Professor
Stephen L. Wolfe, Ph.D., Senior Lecturer

The Major Programs

The Zoology major presents animal biology from the subcellular and molecular to the community and ecosystem levels. As a basic life science major, it is suitable for students who plan to pursue a professional career in Zoology, to do graduate work in Zoology or another life science, or who intend to apply to professional schools in the health sciences. The major is structured to insure breadth of preparation while still allowing individualization of each student's program in accordance with his or her interests.

Students majoring in Zoology in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC Davis and that are judged by the Chemistry Department to cover substantially the same material as upper division courses in the subject at UC Davis.

Choice of College. The Bachelor of Arts degree is offered only in the College of Letters and Science. The Bachelor of Science degree is offered in both the College of Letters and Science and the College of Agricultural and Environmental Sciences.

Zoology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	**40-44**
Chemistry 1A, 1B, 8A, 8B	16
Biological Sciences 1	5
Zoology 2-2L	6
Mathematics 16A-16B or Statistics 102	4-6
Physics 1A-1B or 2A-2B	6
One course from Bacteriology 2, 102, Botany 2, Physics 2C	3-5
Depth Subject Matter	**36-39**
Genetics 100A-100B or 120	4-6
One course from Zoology 148, Genetics 103, Geology 107, 111A, Anthropology 151	3-4
Additional upper division course work in biological science to achieve a total of 36 units or more	26-29
Include at least (a) 15 units in zoology, and (b) one course from three of the five Areas of Study shown below.	
Total Units for the Major	**76-83**

Recommended
Geology 3; Biochemistry 101A-101B or Physiological Sciences 101A-101B

Zoology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	**50-57**
Chemistry 1A, 1B, 1C	15
Chemistry 8A-8B or 128A-128B-128C	6-9
Biological Sciences 1	5
Zoology 2-2L	6
Mathematics 16A-16B or 21A-21B	6-8
Physics 2A, 2B, 2C	9
One course from Bacteriology 2, 102, or Botany 2	3-5
Depth Subject Matter	**49-57**
Biochemistry 101A-101B or Physiological Sciences 101A-101B	6-7
Genetics 100A-100B or 120	4-6
Statistics 102 or 130A-130B	4-8
One course from Zoology 148, Genetics 103, Geology 107, 111A, Anthropology 151	3-4
Additional upper division course work in biological science to achieve a total of 49 or more units	24-32
Include at least (a) 15 units in zoology, (b) 6 units (or 18 hours) of laboratory, and (c) one course from four of the five Areas of Study shown below.	
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 71.	
College of Letters and Science students: Refer to page 88 for a description of requirements to be completed in addition to the major.	
Total Units for the Major	**99-114**

Recommended
Chemistry 5, Mathematics 16C or 21C, Geology 3.

Areas of Study
1. Ecology and behavior: Zoology 125, 147, 149, 155; Environmental Studies 100.
2. Systematics, morphology, and natural history: Zoology 105, 106, 112, 133, 133L, 136, 136L, 137, 137L.
3. Cell biology: Zoology 121A, 121B, 121C, 121L; Botany/Zoology 130.
4. Developmental biology: Zoology 100, 100L, 101.
5. Physiology: Zoology 121C, 142, 142L, 143; Physiology 110, 110L.

Note: A maximum of 5 units of variable-unit courses (numbered 192, 198, and 199) may be applied to upper division elective unit requirements. Zoology 197 is not a variable-unit course. Zoology majors may not substitute course 192 for the upper division laboratory requirement. Courses numbered 197T are not applicable to the upper division elective unit requirement.

Biological Sciences Electives. The following courses are acceptable toward the fulfillment of the upper-division biological sciences requirement in the major programs and may be selected without adviser approval. Other elective courses are approved on an individual basis by petition through an adviser.
Anatomy 100
Anthropology 150, 151, 152, 153, 154A, 154B, 155, 156
Bacteriology, all upper division courses
Biochemistry and Biophysics, all upper division courses
Biological Sciences, all upper division courses
Botany, all upper division courses
Chemistry 107A, 107B
Clinical Pathology 101, 101L, 102
Entomology, all upper division courses except 110, 112
Environmental Studies 100, 110, 116, 121, 122, 123, 150C, 151, 151L
Genetics, all upper division courses
Geology 106, 106L, 107, 107L, 111A, 111B, 145, 146, 150C
Nematology 110
Nutrition 110, 111, 111L, 114
Physiological Sciences 101A, 101B
Physiology, all upper division courses
Psychology 108, 129, 134, 150
Veterinary Microbiology 126, 126L, 128, 132
Wildlife and Fisheries Biology 120, 121

Major Advisers. Students transferring to Davis from another institution and majoring in Zoology must consult an adviser immediately upon matriculation so that their transfer credits can be applied to the major requirements. All new students in the major should contact the Zoology Department Office for adviser assignment. A list of approved upper division courses for the Zoology major is available from the Department Office. Substitutions of other courses for major requirements are arranged through the adviser.

Preprofessional students should establish contact with the Health Sciences Advising Office, in South Hall, to learn what specific courses are required on their transcripts.

Teaching Credential Subject Representative. Students planning for a teaching career should consult the Department of Education in regard to preparation for certification. See page 98 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. J.H. Crowe, M. Hildebrand, B. Mulloney, T. W. Schoener (in charge), and J. Stamps.

Courses in Physiology

Lower Division Courses

2. Introductory Physiology (4) I, Cross
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, Cross
Laboratory—6 hours. Prerequisite: course 2 (completed or in progress).

NOTE: For key to footnote symbols, see page 123.

10. Elementary Physiology (4) II Cross
Lecture—3 hours; discussion—1 hour. Prerequisite: not open for credit to students who have had Biological Sciences 1 Introductory course in physiology for nonscience majors.

Courses in Zoology

Lower Division Courses

2. General Zoology (4) I, Toft; II, ———; III, Mulloney
Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 strongly recommended. Survey of the diversity of animal life and the basic principles of adaptation, evolution, and integration in animals.

2L. Laboratory in General Zoology (2) I, Toft; II, ———; III, Mulloney
Laboratory—6 hours. Prerequisite: course 2 (preferably taken concurrently). Laboratories on the diversity of animal life and basic principles of organismal biology. (P/NP grading only.)

10. Concepts of Zoology (3) III. Watt
Lecture—3 hours. Principal issues of modern zoology for nonscience majors. Diversity, its causes and consequences, self-stabilization, evolution, levels of organization. Implications of zoology for the human situation.

92. Internship (1-12) I, II, III The Staff (Chairperson in charge)
Laboratory—3-36 hours Prerequisite lower division standing and consent of instructor Work-learn experience off and on campus in all subject areas offered in the Department of Zoology. Internships supervised by a member of the faculty. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)
Directed study of a specific topic selected by the student and the instructor. (P/NP grading only.)

Upper Division Courses

100. Embryology (4) I, Armstrong; II, III. The Staff (Chairperson in charge)
Lecture—4 hours. Prerequisite: Biological Sciences 1 and courses 2-2L; concurrent enrollment in course 100L strongly recommended. Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates.

100L. Laboratory in Vertebrate Embryology (2) I, II, III.
Laboratory—6 hours. Prerequisite: course 100 (concurrently). Comparative analysis of the embryonic development of vertebrates. Limited enrollment. (P/NP grading only.)

101. Experimental Analysis of Animal Development (3) III.
Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 100–100L; Biochemistry 101A, 101B; and consent of instructor. Principles and techniques of gamete procurement and embryo maintenance; applications of techniques such as microsurgery, tissue culture, and radioisotopic labeling to experimental study of developmental problems, with emphasis on sea urchins, amphibians, and chickens. Limited enrollment.

105. Phylogenetic Analysis of Vertebrate Structure (5) II. Hildebrand
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2. The structure of the classes and subclasses of vertebrates is described and interpreted in terms of phylogeny.

106. Functional Analysis of Vertebrate Structure (3) III. Hildebrand
Lecture—2 hours; laboratory-demonstration—4 hours. Prerequisite: course 2. Mechanical principles are used to interpret the structure associated with supporting the body, running, digging, climbing, swimming, flying, and feeding. Emphasis is on the skeletal system of mammals.

106P. Project on the Functional Analysis of Vertebrate Structure (1) III. Hildebrand
Project report. Prerequisite: course 106 (may be taken concurrently). A paper of about 2,000 words, or a dissection with explanation, analyzing the function of a selected aspect of vertebrate structure.

112. Invertebrate Zoology (6) II. Grosberg
Lecture—3 hours; laboratory—6 hours; two field trips to the seashore. Prerequisite: courses 2-2L; course in systematics or ecology highly recommended. Survey of most major and minor animal phyla, emphasizing marine forms and focusing on morphology, development, natural history and phylogenetic relationships among the major taxa. Laboratory entails observations of and experimentation on a broad array of local forms.

114A. Integrative Environmental Systems (5) I, Watt
Lecture—3 hours; discussion—1 hour; individual or group project. Prerequisite: Biological Sciences 1 or Economics 1B; sophomore standing. Explanation of complex environmental problems in terms of scientific principles and systems theory, and training in computer modeling of systems performance. (Same course as Environmental Studies 114A.)

114B. Integrative Environmental Systems (5) II. Watt
Lecture—3 hours; discussion—1 hour; individual or group project. Prerequisite: sophomore standing and course 114A. Continuation of course 114A. Explanation of complex environmental problems in terms of scientific principles and systems theory, and training in computer modeling of systems performance. (Same course as Environmental Studies 114B.)

121A. Cell Biology (4) I. Nuccitelli
Lecture—4 hours. Prerequisite: introductory course in biochemistry. This is an introduction to cell biology emphasizing the membrane components of cells and the structure and function of sub-cellular organelles. Students who have had Zoology/Botany 130 may receive only 2 units for course 121A.

121B. Cell Biology (4) II. Wolfe
Lecture—4 hours. Prerequisite: introductory course in biochemistry. This is an introduction to cell biology which concentrates on the nucleus and covers recent findings related to DNA, RNA, protein synthesis and molecular biology. Students who have had Zoology/Botany 130 may receive only 2 units for course 121B.

121C. Advanced Cell Biology (4) III. Baskin
Lecture—3 hours; extensive reading and research report. Prerequisite: Biochemistry 101B and Mathematics 16B. Physical-chemical basis of cell structure and function, including a discussion of aspects of biological thermodynamics, the ionic basis of excitation, and the molecular basis of contractility.

121L. Cell Biology Laboratory (3) II. Baskin
Lecture—1 hour; laboratory—6 hours. Prerequisite: Biochemistry 101A-101B required. Course 121A-121B recommended, or consent of instructor. Exercises illustrating the principles of cell biology; emphasis on individual research employing one or more advanced techniques.

122. Histology (4) III. Crowe
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 121A; working knowledge of elementary physiology is essential. Functional morphology of animal tissues and organs. Emphasis is placed on the use of structural studies in elucidating mechanisms underlying physiological and metabolic processes.

122L. Histology Laboratory (3) III. Crowe
Laboratory—6 hours. Prerequisite: course 122 (may be taken concurrently). Laboratory practice in histo- and cyto-techniques; use of such techniques in research Design and execution of a research project is required.

125. Animal Ecology (3) I, Salt; II, Schoener,———; III,———
Lecture—3 hours. Prerequisite: courses 2-2L. A general survey of the concepts of animal ecology.

130. Survey of Cell Biology (4) I, Falk (Botany), Wolfe
Lecture—4 hours. Prerequisite: Chemistry 8B or 128C; introductory course in biochemistry strongly recommended. Survey of cell biology, including the major cell organelles and structures and their function in energy metabolism, motility, synthesis, and cell division. Structure and function of the cell surface and cell origins also considered. Not open to students who have received credit for Zoology 121A-121B. (Same course as Botany 130.)

133. Patterns in Vertebrate Biology (3) III Jameson
Lecture—3 hours. Prerequisite: course 2. Vertebrate thermoregulation and water balance, circadian and circannual activity, communication, breathing, movements and feeding patterns.

***133L. Systematics and Field Studies in Cold-Blooded Vertebrates** (3) III.
Laboratory—6 hours; field trips. Prerequisite course 133 and consent of instructor. Systematic and faunal studies on poikilothermous vertebrates. Offered in odd-numbered years.

136. Mammalogy (2) I. Rudd
Lecture—2 hours. Prerequisite: course 125 or equivalent general course in ecology. Systematics, life history, reproduction, distribution and physiology of wild mammals.

136L. Mammalogy Laboratory (3) I. Rudd
Laboratory—6 hours; extensive weekend field-trips. Prerequisite: course 125 or 136, and consent of instructor. Systematics of California mammals; techniques of study in professional mammalogy. May be taken concurrently with course 136.

137. Ornithology (2) III. Rudd
Lecture—2 hours. Prerequisite: course 125 or the equivalent course in ecology. Systematics, distribution, physiology, and population dynamics of birds. Students who have had Wildlife and Fisheries Biology 111 may not receive credit for this course.

137L. Ornithology Laboratory (3) III. Rudd
Laboratory—6 hours. Prerequisite: course 125 or 137 (may be taken concurrently) and consent of instructor. Individual study and field trips strongly emphasized. Systematics, behavior, population dynamics and reproduction of California birds.

138. Ecology of Tropical Latitudes (3) II Rudd
Lecture—3 hours. Prerequisite: courses 2-2L or the equivalent; general course in introductory ecology recommended. Physical and biological aspects of tropical zones Distributions, number, ecological and evolutionary relationships of tropical animals.

139. Patterns of Vertebrate Reproduction (3) II Jameson
Lecture—2 hours; term paper. Prerequisite: any upper division course in vertebrate biology Reproductive adaptations and environmental responses of wild vertebrates: seasonality, reproductive diapause, growth and sexual maturity; development of viviparity and other topics. Offered in odd-numbered years.

141. Principles of Systematic Zoology (3) III. Shapiro
Lecture—2 hours; biweekly research projects. Prerequisite: course 2; 148 or Genetics 103 recommended Historical background, philosophical rationale, contemporary approaches, and working rules of animal biosystematics, including International Code of Zoological Nomenclature.

142. Invertebrate Physiology (4) II Crowe
Lecture—3 hours; term paper; individual conferences. Prerequisite: course 112, Chemistry 1A, 1B, Physics 2B; Biochemistry 101A, 101B recommended. Comparative physiology of invertebrate organ systems.

142L. Invertebrate Physiology Laboratory (3) II. Crowe
Laboratory—6 hours (includes research project). Prerequisite: course 142 (may be taken concurrently) Experiments on the physiological mechanisms of invertebrate organ systems. Design and execution of a research project.

143. Neurobiology (4) II Mulloney, Wilson
Lecture—3 hours; extensive reading Prerequisite: courses 2-2L; Biochemistry 101A-101B or the equivalent. Neuronal structure; impulse transmission; synapses; transmitters and transmitter pharmacology; receptors; growth and differentiation of neurons and nervous systems; genetics of behavior.

143L. Neurobiology Laboratory (6) II. Mulloney, Wilson
Lecture—1 hour, discussion—1 hour; laboratory—12 hours Prerequisite: course 143 and consent of instructor; Physics 2B recommended Students will learn to record action potentials and synaptic circuits, to interpret quantitatively their recordings, and to use vital dyes and intracellular stains Limited enrollment.

147. Zoogeography (4) III Jameson
Lecture—3 hours; term paper. Prerequisite: courses 2-2L or Entomology 100 Movements of terrestrial animals. The role of geologic, climatic, and biologic changes in the geographic distribution of animals. Offered in even-numbered years.

148. Animal Phylogeny and Evolution (4) I. Shapiro
Lecture—4 hours. Prerequisite: course 2 or the equivalent and Genetics 100; ecology and biochemistry recommended. Introduction to current evolutionary theory The place of evolution as the central unifying theory to biology will be emphasized.

149. Evolution of Ecological Systems (4) III Shapiro
Lecture—3 hours; term paper Prerequisite: course 125 or Environmental Studies 100 (or the equivalent) and course 148 or Genetics 103 (or the equivalent) Evolution as an organizing force in natural communities Coadaptation in trophic and competitive relationships. Ecology of polymorphisms, clines, and speciation

155. Behavior of Animals (5) II Stamps
Lecture—3 hours; discussion—1 hour, term paper. Prerequisite: courses 2-2L. Basic principles, mechanisms and evolution of behavior, with special reference to the significance of behavior under natural conditions Students who have had Animal Science 104 may receive only 4 units of credit for this course.

***158. Evolution of Behavior** (3) I.
Lecture—3 hours. Prerequisite: course 148, Genetics 103, or consent of instructor; course in population genetics strongly recommended and basic course in behavior, ecology, and physiology recommended. Current interpretations of the adaptive significance of behavioral patterns and the mechanisms of their evolution. Emphasis on the genetic basis of behavioral evolution through examination of data and theoretical models.

189. Introduction to Biological Research (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: upper division standing in Zoology or related biological science and concurrent enrollment in course 199; consent of instructor. Introduction to research methods in biology. Presentation and discussion of research by faculty, graduate and undergraduate students. May be repeated for credit up to a total of 3 units. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

NOTE: For key to footnote symbols, see page 123.

Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the Department of Zoology. Internships supervised by a member of the faculty. (P/NP grading only.)

197. Senior Colloquium in Zoology (2) III. Shapiro
Lecture-discussion—2 hours. Prerequisite: senior standing. The consideration of innovation and synthesis in broad areas of zoology. (P/NP grading only.)

197T. Tutoring in Zoology (1-5) I, II, III. The Staff (Chairperson in charge)
Discussion—1-2 hours. Prerequisite: upper division standing. Experience in teaching zoology under guidance of staff. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Directed study of a specific topic selected by the student and the instructor. (P/NP grading only.)

Graduate Courses

202. Biomathematics (6) III. Watt
Lecture—4 hours; laboratory—6 hours. Prerequisite: two courses in calculus; three courses in statistics. Mathematical aspects of physiology, ecology, and epidemiology; development and testing of models, mathematical description of biological systems; measurement, analysis, simulation and optimization in biology. Offered in odd-numbered years.

203. Global and Regional Modelling (6) III. Watt
Lecture—1 hour; discussion—1 hour; seminar—3 hours; laboratory—3 hours. Prerequisite: Mathematics 16A-16B; Statistics 106 and 108 or 131A-131B-131C; FORTRAN. Use of statistical analysis of data, mathematical 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) III. 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.

205. Pattern Formation (4) II. Nuccitelli
Lecture—3 hours; term paper. Prerequisite: course 100 or 121A or the equivalent, and consent of instructor. Morphology and mechanism of pattern formation beginning with ooplasmic segregation. Emphasis will be on cell polarity but some multicellular systems will also be covered. Offered in even-numbered years.

206. Mechanisms of Organogenesis (4) II. Erickson
Lecture—3 hours; term paper. Prerequisite: course 100. Course will demonstrate the various means by which several cell types become organized and differentiate to form a functional unit, using five selected organ systems. Offered in odd-numbered years.

207. Topics in Advanced Ornithology (4) III. van Riper
Lecture—2 hours; laboratory—6 hours. Prerequisite: graduate standing; course 137 or the equivalent. Advanced training in field of ornithology. Specific ecological and morphological areas of avian study. Laboratory oriented toward the breeding ecology of birds in the Central Valley area of California, but will also deal with aspects of avian anatomy.

222. Topics in Advanced Ecology (2) I, Schoener
Lecture—1 hour; seminar—1 hour. Prerequisite: Ecology 201A-201B or the equivalent. Each year, some topic of current research interest will be critically reviewed. Possible topics include feeding strategies, island ecology, competition. Time will be divided between lecture and student presentations. May be repeated for credit when a different topic is studied. (S/U grading only.)

***224. Developmental Biology** (3) III. Erickson
Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: course 100 and consent of instructor; Biochemistry 101 recommended. Introduction to research in development. Observations and experiments involving a variety of developing systems and experimental methods, with critical interpretation of the results. Open to qualified undergraduates. Offered in odd-numbered years.

225. Biology of Fertilization (3) I, Grey
Lecture—2 hours; term paper. Prerequisite: course 121A or the equivalent and consent of instructor. The morphology, physiology and biochemistry of gametes and the mechanism and consequences of their union.

226. Cellular Biology of the Malignant Transformation (1) I, Armstrong
Lecture—1 hour. Prerequisite: course 100; course 121A or 121B or Biochemistry 101A and 101B. Topics include: factors causing the malignant transformation of cells, control of growth of tissue cells (and loss of control in transformed cells), mechanisms of intercellular invasion, natural defense mechanisms against transformed cells. Emphasis is at the cellular and molecular levels.

***228. Experimental Animal Ecology** (3) III. Salt
Lecture—2 hours; 3 weekend field trips, 2 written critiques. Prerequisite: course in animal ecology. Discussion of means of generating ecological hypotheses and methods of testing those hypotheses. Topics will include analysis of field observation, experimental design in both field and laboratory, and interpretation of results. Limited enrollment.

236. Muscle Physiology (4) I, Baskin
Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: Biochemistry 101A-101B and Mathematics 16B or 21B; or consent of instructor. The physical and chemical aspects of muscle function.

240. Topics in Cell Biology (3) II. Deamer
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Discussion and review of current topics in the area of cell biology. May be repeated for credit.

241. Membrane Biology (3) II. Deamer
Lecture—3 hours. Prerequisite: courses 121A-121B or Biochemistry 101A-101B recommended, or consent of instructor. Course emphasizes biological aspects of membrane function and structure. The general approach will be to discuss cell biology from the viewpoint of membranous components of cells. Offered in even-numbered years.

243. Topics in Cellular and Behavioral Neurobiology (2) III, Mulloney, Wilson
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.)

252. Ecology of Arthropod Populations (2) II. Toft
Lecture—1 hour; seminar—1 hour; student presentations. Prerequisite: course 125 or the equivalent; graduate-level background in ecology recommended. In-depth examination of the ecology of arthropod populations, emphasizing population interactions particularly: competition, predation (including parasitism), mutualism. Topics will vary from year to year. Offered in odd-numbered years. (S/U grading only.)

254. Ecology of Parasites (2) II. Toft
Lecture—1 hour; seminar—1 hour. Prerequisite: course 125 or Entomology 104 or the equivalent; graduate-level background in ecology recommended. Population dynamics of parasites and parasitoids, emphasizing species of ecological importance but also including species of medical and economic interest. Offered in even-numbered years. (S/U grading only.)

266. Seminar in Cell Biology (2) I, Wolfe
Seminar—2 hours. Prerequisite: consent of instructor. Discussion of recent literature on the physical and chemical aspects of organization and function of living systems, topics of current interest in ultrastructure and function of cells. Organizational and functional properties on the molecular and cellular levels of biological systems.

269. Research Conference in Developmental Biology (1) I, II, III. Armstrong, Erickson, Grey, Nuccitelli
Seminar—1 hour. Prerequisite: consent of instructor. Presentation and critique of faculty and graduate student research in developmental biology. Intended primarily for graduate students. (S/U grading only.)

287. Seminar in Animal Behavior (2) I, II. Stamps
Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on the principles and recent developments in invertebrate and vertebrate animal behavior.

290. Current Topics in Zoology (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Seminars presented by guest lecturers describing their research activities. May be repeated for credit. (S/U grading only.)

290C. Research Conference in Zoology (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate standing in Zoology and/or consent of instructor; concurrent enrollment in course 299. Presentation and discussion of faculty and graduate student research in biology. May be repeated for credit. (S/U grading only.)

291. Current Topics in Developmental Biology (1) III. The Staff (Chairperson in charge)
Seminar—2 hours (alternate weeks). Seminar on current topics in developmental biology will be presented and discussed. Speakers will be drawn from Universitywide system, and outside the system when feasible. (S/U grading only.)

292. Seminar in Development (2) II. Armstrong
Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on embryology, morphogenesis, and developmental mechanisms.

293. Seminar in Invertebrate Zoology (2) III. Crowe
Seminar—2 hours. Prerequisite: course 112, or consent of instructor. Critical review of the literature in selected topics and taxa in the invertebrata. Open to qualified undergraduates.

***294. Seminar in Animal Ecology** (3) III. Staff
Seminar—3 hours. Prerequisite: course 125 and graduate standing. Readings and discussions of advanced topics in the population and community ecology of animals.

295. Seminar in Marine Invertebrate Ecology (2) I, Quinn
Seminar—2 hours. Prerequisite: course 112 and consent of instructor. Reports and discussions on current topics in marine invertebrate ecology. Open to qualified undergraduates.

296. Seminar in Geographical Ecology (2) I, Shapiro
Seminar—2 hours. Prerequisite: course 125 or 148 or Genetics 103 or consent of instructor. Recent developments in theoretical and experimental biogeography, the biology of colonizing species, and related topics.

***297. Seminar in Systematic Zoology and Evolution** (2) III. Rudd
Seminar—2 hours. Prerequisite: consent of instructor. Principles of animal classification, speciation and the evolution of higher categories; emphasis on modern concepts and pertinent contributions from the fields of genetics and paleontology.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

390. Methods of Teaching Zoology (2) I, II, III. The Staff (Chairperson in charge)
Lecture—1 hour; discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Practical experience in the methods and problems of teaching zoology and related biological sciences. Includes analyses of texts and supporting material, discussion of teaching techniques and preparing and conducting of laboratory and discussion sections. May be repeated for credit for a maximum of 8 units. (S/U grading only.)

NOTE: For key to footnote symbols, see page 123.

OTHER USEFUL PUBLICATIONS

Undergraduate Admissions Circular
A complete statement of the University's requirements for admission as an undergraduate.

Office of Undergraduate Admissions, 175 Mrak Hall, or from your high school or community college counselor. (No charge.)

Answers for Transfers
A question-and-answer booklet for students who want to attend a community college before transferring to the University. Gives information about University admission requirements, costs, financial aid, and advice on planning your program and transferring courses to UC.

Available from University Admissions Offices and Relations with Schools Offices, and at community college counseling offices. (No charge.)

UC Davis Poster/Calendar
Information for prospective students about UCD programs and activities, plus a wall poster and calendar marking important dates and UC application deadlines.

Office of Undergraduate Admission, 175 Mrak Hall. (No charge.)

Graduate Announcement, UC Davis
Brief descriptions of the graduate programs and research resources including admission requirements, procedures and dates for filing applications, degrees offered, fields of study, degree requirements, fees and expenses, financial aid and student services, and sources of additional information. Course descriptions are not included.

Dean of the Graduate Division, 252 Mrak Hall. (No charge.)

College of Engineering Bulletin
A detailed description of College of Engineering programs, majors, and course offerings.

College of Engineering Dean's Office, 2132 Bainer Hall. (No charge.)

Graduate School of Administration Bulletin
Admission requirements, description of academic programs, courses of instruction, faculty, and general information.

Graduate School of Administration, 308 Voorhies Hall, University of California, Davis 95616. (No charge.)

School of Law Catalog
A detailed description of admissions requirements, academic programs, courses of instruction, faculty, law school activities, and general information about the School of Law.

Office of Admissions, School of Law, University of California, Davis 95616. (No charge.)

School of Medicine Bulletin
A detailed description of academic programs, courses of instruction, faculty, student activities, admissions requirements, and general information about the School of Medicine.

Office of Admissions, School of Medicine, University of California, Davis 95616. (No charge.)

Announcement of the School of Veterinary Medicine
A complete statement of the School of Veterinary Medicine requirements for admission into the Doctor of Veterinary Medicine program.

Office of Associate Dean—Student Services, School of Veterinary Medicine, University of California, Davis 95616. (No charge.)

Class Schedule and Room Directory
Issued quarterly. Lists times and place of meeting for specific classes, instructors, and units of credit. Also contains information on registration and enrollment in classes.
Available for 25 cents at the UCD Bookstore. (Not available by mail.)

Summer Sessions Bulletin
Complete information about summer session courses and instruction.

Office of the Summer Sessions, 376 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 at UCD
Information on financial aid: grants, loans, and work-study at UCD.

Financial Aid Office, North Hall. (No charge.)

People and Places at UCD
The student orientation handbook giving descriptions of campus services, activities, and information sources.

Available free from Advising Services, South Hall. (Not available by mail.)

Student Directory
Student directory, combined with information on ASUCD activities and services and campus organizations.

Student Viewpoint
Student-compiled evaluations of courses and professors by in-class surveys, *ASUCD Catalog* of student services and organizations and *Student Directory* of student names, addresses and phone numbers.

Student Viewpoint Office, 13 Lower Freeborn. (No charge. Available by mail.)

Venture
University Extension quarterly catalog. Complete information about Unex courses, including times and locations.

University Extension, 414 Surge IV. (No charge.)

City of Davis Information
Chamber of Commerce, 228 B Street, Davis, CA 95616.

CORRESPONDENCE DIRECTORY

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

Office of the Chancellor
Mrak Hall
752-2065

College of Agricultural and Environmental Sciences
228 Mrak Hall
752-0107

College of Engineering
2132 Bainer Hall
752-0553

College of Letters and Science
150 Mrak Hall
752-0392

Graduate Division
252 Mrak Hall
752-0650

Graduate School of Administration
308 Voorhies Hall
752-7362

School of Law
1011 King Hall
752-0243

School of Medicine
Medical Sciences 1C
752-0331

School of Veterinary Medicine
1018 Haring Hall
752-1360

Office of Summer Sessions
376 Mrak Hall
752-1647

University Extension
414 Surge-4
752-0880

Admissions

Undergraduate:	Office of Admissions 175 Mrak Hall 752-2971
	EOP Office of Admissions 175 Mrak Hall 752-2993
Graduate:	Graduate Division Admissions 252 Mrak Hall 752-0655
Administration:	Graduate School of Administration 311 Voorhies Hall 752-7399
Law:	School of Law Admissions 115 King Hall 752-6477
Medicine:	School of Medicine Admissions Medical Sciences 1C 752-2717
Veterinary Medicine	School of Veterinary Medicine Admissions 1044 Haring Hall 752-1383

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

Financial Aid Office
North Hall
752-2390
(undergraduate and graduate loans, grants, employment information)

Scholarship Office
130 North Hall
752-2397
(undergraduate scholarships)

Fellowships and Graduate Scholarships
Graduate Division
252 Mrak Hall
752-7481

Teaching and Research Assistanships
Write to department or group concerned, addresses given in the *Graduate Announcement.*

Housing

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

ASUCD (Associated Students UCD)
3rd floor, Memorial Union
752-1990

Memorial Union Information Desk
752-2222

Office of Public Affairs
334 Mrak Hall
752-1930

Relations with Schools/EOP Outreach Services
11 Mrak Hall
752-1099

Services to Handicapped Students Office
101 Silo Student Center
752-3184 (voice), 752-6889 (telephone device for the speech and hearing impaired)

Residency Matters, Attorney in
590 University Hall
University of California
Berkeley, CA 94720

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

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

GLOSSARY

Academic Senate The faculty governing body of the University. Consists primarily of the regular faculty and certain administrative officers. Determines conditions for the admission of students and for granting certificates and degrees; develops educational policy; and authorizes and supervises all courses in the University.

Academic year Starts at the beginning of the Fall Quarter, ends at the close of the Spring Quarter; does not include summer sessions.

Advanced degree Any degree beyond the bachelor's degree.

AOB Stands for"Academic Office Building," a building that houses administrative and academic offices. AOB is the informal designation until the building is officially named.

ASUCD (Associated Students of the University of California, Davis) The undergraduate student body governing organization at UCD.

College A subdivision of the campus instructional system (e.g., College of Letters and Science). The colleges are further divided into departments (e.g., English, Zoology, etc.) which offer specialized curricula.

Continuing student One who was registered for the immediately preceding quarter.

Credential A license for public school teaching in California. Programs offering the multiple-subject (elementary) or single-subject (high school) teaching credential are supervised by the Graduate Division in coordination with the Department of Education.

Curriculum (plural, curricula) All the courses of study offered by the University. May also refer to a particular course of study (major) and the courses in that area.

Discipline. A branch of knowledge or teaching. Typically refers to an area of study or a major field.

Drop/Add Petition A petition used when you want to drop, change or add a course to your study list.

Enrollment The actual placing of a student in classes; to be on record as officially registered in a class.

Good standing An undergraduate student who has at least a 2.0 grade-point average in all work completed at the University of California, and who has maintained his or her minimum unit progress requirement for UCD, is considered a student in good standing.

Grade-point average (GPA) The GPA is computed in the following manner. You receive a certain number of points for each grade received. An"A" grade is worth 4 points, a "B" worth 3, a "C" worth 2,"D" worth 1, and an "F" worth 0. The total number of points accumulated is then divided by the number of course credits taken for a letter grade. The result is the grade-point average. Passed, Satisfactory, Not Passed, Unsatisfactory, 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 200-299.

GSA (Graduate Student Association) 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 and/or professional students are numbered 298, 299, 398, 399, 498, and 499. These courses are restricted to qualified students for a designated number of units.

International student A student enrolled in nonresident status who is a citizen or resident of another country.

Lower Division Freshman and sophomore standing at UCD (fewer than 84 units completed); also refers to UCD courses numbered from 1 through 99.

Major The area of academic concentration in which the degree is conferred.

Matriculate To enroll for a degree in a college or school.

Minimum progress Refers to the number of units a student must have completed and passed by the end of a specific number of quarters at UCD.

New student A student beginning work at any level at UCD is considered to be a new student. After one quarter's attendance at Davis, a student is considered to be a continuing student. Graduate students who were enrolled at UCD as undergraduates are considered to be new students for their first quarter of graduate work.

Part-time student A student enrolled in the Part-Time Degree Program.

Passed/Not Passed (P/NP) option 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 in cluded in a student's grade-point average, but the units are counted toward the 180-unit graduation requirement.

PELP Any student, new or continuing, can interrupt formal study in a given quarter (or for a maximum of one academic year) by enrolling in the Planned Education Leave Program before the tenth day of instruction. You will not be eligible for most University services, but student employment and counseling services and faculty advising are available. PELP ensures your space in registration for the quarter following your leave.

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.

Photo ID card Given to a student who is registered and has paid all fees for the current quarter. You will need this card to secure grades, gain student admittance to campus events, and to identify yourself as a UCD student. If you lose your Photo ID card there is a $5 replacement fee for card and $3 fee for quarterly sticker.

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 Administration, Law, Medicine, or Veterinary Medicine.

Probation An indication that performance is below standard because of academic deficiencies; a trial period in which a student is permitted to redeem failing grades or deficient units.

Quarter A subdivision of the academic year at UCD, consisting of three 10-week terms (Fall, Winter, and Spring Quarters). The two 6-week summer sessions provide a quarter's work in a more concentrated format, but are not considered regular quarters. (Attendance at both summer sessions, however, may count as one quarter in residence.)

Quarter units Academic work at the University is measured by quarter units of credit which determine the amount of time a student has formally devoted to a given subject. To convert these units to semester units multiply by ⅔; 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 (see Photo ID card).

Regular session Refers to Fall, Winter, and Spring Quarters. Students in the School of Medicine also attend a Summer Quarter.

Repeated courses Courses in which a grade of D or F for undergraduate students and C, D, or F for graduate students can be repeated for a letter grade only. Courses taken on a P/NP or S/U grading basis can be repeated on the same basis or for a letter grade. There are limitations on the number of repeated units that count toward a degree.

Residence This word is used in a number of senses in this catalog; care must be taken to determine the meaning of the word each time it is used: (1) to denote registration in a regular session (i.e., when a student is "in residence" during Fall, Winter, or Spring Quarters); (2) to denote the period of time that a student must be registered at UCD in order to be eligible for graduation (i.e., academic residence); (3) to denote a student's state of residence (e.g., California) to determine if non-resident tuition must be paid (i.e., legal residence); (4) to indicate the student's place of residence (i.e., living quarters).

Sabbatical A leave of absence granted to a University professor for travel, research, etc. May be from one quarter to a full year.

Satisfactory/Unsatisfactory The equivalent of Passed/Not Passed for graduate students. The "S" grade is given for a grade of B- or better in graduate courses and C- or better in undergraduate courses.

Semester A subdivision of the academic year into two sessions, usually fall and spring, each lasting approximately 18 weeks. Only the School of Law uses the semester system at UCD. To convert semester units to quarter units, multiply by 3/2.

Study List The official program of courses for which a student registers. Your course enrollment form 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 study plan.

Subject A The University's requirement in English composition which must be completed to receive the bachelor's degree.

Summer sessions Two 6-week summer sessions are offered between the close of Spring Quarter and the opening of Fall Quarter. Regular instruction, both undergraduate and graduate, is offered for full credit.

TA (Teaching Assistant) TA's are graduate students, usually on the doctoral level, who teach on a part-time basis while pursuing their degrees. They are selected, trained, and supervised by senior faculty members in each department.

TB Stands for "temporary building," usually a trailer or prefabricated building not intended as a permanent facility.

TBA Stands for "to be announced." In the *Class Schedule and Room Directory* course listings, TBA may refer to class meeting time, instructor's name, or room number for class meeting.

Tenure Denotes security of employment until retirement; may be granted to a faculty member after a specified number of years at the University.

Term A regular quarter (fall, winter, or spring).

Transcript An official copy of your academic record (grades) at an educational institution such as the University of California.

Undergraduate A college student who is pursuing a bachelor's degree.

Unit Courses are assigned a unit value based on one unit of credit for every three hours of work (in-class and preparation time) per week by the student. A student's progress in the University and class level are determined in part by the number of units completed.

Upper Division Junior and senior standing at UCD, based upon completion of at least 84 units; also refers to UCD courses numbered 100-199.

Work-Learn An internship program providing on-the-job experience in a student's field of interest. Participation may be full time (during the summer or academic year) or part time, and may be paid or volunteer. Academic credit may also be earned.

Work-Study A financial aid program which provides eligible students with part-time jobs on campus or with off-campus nonprofit organizations.

APPENDIX

STATEMENT ON LEGAL RESIDENCE AT THE UNIVERSITY OF CALIFORNIA

Each new student entering the University of California (and each former student returning after an absence of one or more quarters) is required to submit a Statement of Legal residence to the Office of the Registrar. This Statement is used by the Residence Deputy 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 nonresident tuition fee (see page 35).

The residence determination date is the day instruction begins at the last of the University of California campuses to open for the quarter, and for schools on the semester system, the day instruction begins for the semester.

Establishing Legal Residence for Tuition Purposes

In order to be classified as a resident for tuition purposes at the University of California upon admission, an adult student must have established his or her residence in California at least one year immediately preceding the residence determination date for the term during which he or she proposes to attend the University and must have relinquished any prior residence. An adult student must couple his or her physical presence within this State for one year with objective evidence that such presence is consistent with his or her intent in making California his or her permanent home and, if these steps are delayed, the one-year durational period will be extended until BOTH presence and intent have been demonstrated for one full year. Physical presence within the state solely for educational purposes does not constitute the establishment of California residence under State law regardless of the length of his or her stay in California.

Relevant indicia which can be relied upon to demonstrate one's intent to make California his or her permanent residence include, but are not limited to, the following: registering and voting in California elections; designating California as his or her permanent address on all school and employment records, including military records if one is in the military service; obtaining a California driver's license or California Identification Card, if a non-driver; obtaining California vehicle registration; paying California income taxes as a resident, including income earned outside this state from the date residence is established; establishing an abode where one's permanent belongings are kept within California; licensing for professional practice in California; and the absence of these indicia in other states during any period for which residence in California is asserted. Documentary evidence may be required. No single factor is controlling or decisive. All relevant indicia will be considered in the classification determination.

The 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 last maintained his or her 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 (see Exceptions below). Where the residence of the minor is derived, the California residence of the parent from whom it is derived must satisfy the one-year durational requirement.

A man or a woman establishes his or her own residence. A woman's residence shall not be derivative from that of her husband, or vice versa.

Reclassification

Students seeking reclassification whose parents have not been residents of California for at least one year immediately preceding the term, must establish that they are financially independent of their parents. This factor is in addition to the other requirements necessary for a resident classification. (Graduate students who are teaching assistants, research assistants or teaching associates employed on a 0.49 or more time basis are exempt from the financial independence requirement.)

A student must petition to have his or her status changed at the Office of the Registrar and documentation of residence (driver's license, voter registration receipt, etc.) may be requested at that time. All changes of status must be initiated two weeks prior to the in-person registration period for the quarter or semester for which the student intends to be reclassified.

Detailed information concerning reclassification can be obtained by contacting the Residence Deputy at the Registrar's Office.

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.

Incorrect Classification

Those classified incorrectly as residents are subject to reclassification and to payment of all nonresident fees not paid. If incorrect classification results from false or concealed facts (by the student), the student also is subject to University discipline. Resident students who become nonresidents must immediately notify the Residence Deputy at the Registrar's Office.

Inquiries and Appeals

Inquiries from prospective students regarding residence requirements for tuition purposes should be directed to the Residence Deputy at the Office of the Registrar. 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 Legal Analyst—Residence Matters, 590 University Hall, 2200 University Avenue, Berkeley, California 94720, within 120 days after notification of the final decision by the Residence Deputy.

Exceptions

1. A minor student who remains in this state after his or her parent, who was a resident of California for at least one year immediately prior to leaving but has established residence elsewhere shall be entitled to retain resident classification if the student enters the University within one year after the parent moves, so long as continuous attendance is maintained at the University.

2. Nonresident students who are minors or 18 years of age who can show that they have been totally self-supporting through employment and actually present within California for the entire year immediately prior to the residence determination date and have demonstrated the intent to make California their permanent home may be eligible for resident status.

3. A student shall be entitled to resident classification if immediately prior to the residence determination date he or she has lived with and been under the continuous direct care and control of any adult other than a parent for not less than two years, provided that the adult having such control has been a California resident during the year immediately prior to the residence determination date. This exception continues until the student has attained the age of majority and has resided in the state the minimum time necessary to become a resident student, so long as continuous attendance is maintained at an institution.

4. Exemption from payment of the nonresident tuition fee is available to the natural or adopted child, stepchild 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 (1) the member of the military is transferred on military orders to a place outside this state where he continues to serve in the armed forces or (2) the member of the military retires from active duty immediately after having been on active duty in California, the student is entitled to retain resident classification so long as continuous attendance is maintained.

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 upon admission if the student has been lawfully admitted to the United States for permanent residence in accordance with all applicable 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. Nonresident aliens who have been officially granted asylum or refugee status or who are present in the United States under the terms of visa classifications A, E, G, I, K, or L who can demonstrate California residence for more than one year immediately prior to the residence determination date while holding such visa may be entitled to resident classification. Inquiries should be directed to the Residence Deputy.

A student who is a minor alien shall be entitled to resident classification upon admission if the student and the parent have been lawfully admitted to the United States for permanent residence in accordance with all applicable laws of the United States, provided the parent has had residence in California for more than one year after admission to permanent residence prior to the residence determination date for the applicable term. Minor students holding A, E, G, I, K, or L visas should contact the Residence Deputy for information about eligibility for resident status.

7. Children of deceased public law enforcement or fire suppression employees, who were California residents and who were killed in the course of law enforcement or fire suppression duties, may be entitled to resident status.

Waivers Of Nonresident Tuition

To the extent funds are available, nonresident tuition waivers may be granted to spouses and dependent, unmarried children under age 21 of University faculty members who are qualified for membership in the Academic Senate; to unmarried, dependent children under age 21 of a full-time University employee whose permanent assignment is outside California and who has been employed by the University for more than one year immediately prior to the opening of the term. Inquiries regarding these waivers should be directed to the Residence Deputy.

In addition, certain student Teaching Assistants and Teaching Fellows, and certain graduate students designated as University Fellows and Distinguished Scholars may be eligible for nonresident tuition waivers or fellowships. Such students should contact the Graduate Division at their campus for further information.

DISCLOSURES FROM STUDENT RECORDS

In accordance with the Federal Family Educational Rights and Privacy Act of 1974 and campus procedures implementing the **University of California Policies Applying to the Disclosure of Information from Student Records,** students at the Davis campus of the University have the right:

- To inspect and review records pertaining to themselves in their capacity as students;
- To have withheld from disclosure, absent their prior consent for release, personally identifiable information from their student records, with exceptions as noted in Section 10.70 of the University's policies;
- To inspect records maintained by the campus of disclosure of personally identifiable information from

their student records;

- To seek correction of their student records through a request to amend the records or a request for a hearing; and

- To file complaints with the Department of Education regarding alleged violations of the rights accorded them by the Federal Act.

These rights are implemented on the Davis campus by UCD Policy and Procedure Manual, Section 320-21, "Disclosure of Information from Student Records."

Questions about these rights should be referred to Jeanne Wilson, Office of Student Activities and Judicial Affairs, telephone 752-1128. Copies of the Federal Act, the full text of the UC Policies and the UCD Policy and Procedure Manual, Section 320-21, may be consulted at the Reference Desk of the Shields Library. Copies of the above may be obtained at the Office of Student Activities and Judicial Affairs.

Categories of *personally identifiable information* designated by the campus as public information are: name, address, telephone listing, date and place of birth, major field of study, dates of attendance, degrees and honors received, the most recent educational institution attended, participation in intercollegiate athletics and the name, weight, and height of the participants on intercollegiate University athletic teams; provided, however, that address and telephone numbers are not public information with respect to interns, residents, and fellows, and that with respect to these students, public information also includes primary hospital assignment, field of residency training, and name of medical school awarding the M.D. degree.

Students may request, in writing, by the last day of registration, that any or all personally identifiable information from their records not be regarded as public information. Students who desire to withhold their addresses and telephone listings may so indicate on the Student Data Card included in the registration materials. Students who desire to withhold any other item of information in the list from the category of public information must file a form in the Registrar's Office indicating which items they wish withheld.

Students availing themselves of this right should understand what the consequences of this action may be. For example, if a request is made to withhold from disclosure a student's name and degrees and honors received, the campus cannot make public any honors received by the student, e.g., the award of a Regents Scholarship or election to Phi Beta Kappa, and cannot include the student's name and degree earned in the campus commencement program without the written consent of the student. Similarly, if a request is made to withhold from disclosure a student's name and dates of attendance, a student's status as a student cannot be verified for potential employers without written consent of the student. Furthermore, if a student's last instruction to the campus was to withhold from disclosure the degree granted to that student and the date on which the degree was conferred, that information cannot be confirmed for a third party in connection with the appointment of that graduate to a new position or published in connection with an honor that individual subsequently receives. Students may reverse the decision of a previous quarter at registration for a new quarter on the student data form, or at any time by filing a form with the Registrar's Office indicating which items they now wish released.

PROPORTION OF UCD GRADUATES FINDING WORK IN THEIR FIELD OF CHOICE[1]

The percent of UCD alumni whose full-time job is in the field of their choice is shown by field of study and number of years since receiving the bachelor's degree. Figures do not include the 12 percent of 1979 graduates and the 6 percent of 1973 graduates who had not decided on a career field at the time of the survey.

Years Since Graduation	Field of Study[2]										
	Animal Science	Applied Economics	Food Science	Plant Science	Bio-science	Resource Science	Engi-neering	Humanities	Physical Science	Social Science	Total Percent
	—proportion (%) finding work in field of choice—										
1 year	56	72	79	79	53	76	93	51	71	55	67
7 years	85	100	82	67	81	79	95	67	94	75	79

[1]Source: A 1980 survey of 1979 and 1973 UCD graduates conducted by Student Affairs Research and Information, University of California, Davis.

[2]*Fields of Study* are a group of related undergraduate majors; for example, "Animal Science" would include such majors at UCD as Animal Science, Avian Sciences, and Wildlife and Fisheries Biology.

Appendix

RETENTION DATA[1] AND GRADUATION RATES AT UCD

Freshmen

(Retention and graduation rates for regularly admissible undergraduates entering UCD as freshmen.)

Fall Quarter of Initial Enrollment:	Number of Students	Percent Enrolled 4 Quarters	*Percent Graduating in 4 Years	5 Years
1974	2,004	88%	43%	64%
1975	2,174	88%	41%	64%
1976	1,912	90%	40%	64%
1977	2,081	86%	33%	57%
1978	2,216	88%	30%	—

Transfer Students

(Retention and graduation rates for regularly admissible undergraduates transferring to UCD as juniors.)

Fall Quarter of Initial Enrollment:	Number of Students	Percent Enrolled 4 Quarters	*Percent Graduating in 2 years	5 years
1976	999	81%	40%	67%
1977	811	81%	42%	69%
1978	777	85%	44%	71%
1979	677	84%	36%	67%
1980	608	85%	34%	—

*These are not necessarily years of *continuous* enrollment. Students may drop out or go on Planned Educational Leave for a quarter or longer, and then resume their studies.

[1]Source: Student Affairs Research and Information, University of California, Davis (February 1984).

AVERAGE MONTHLY SALARY OFFERED TO GRADUATES WITH BACHELOR'S, MASTER'S, AND DOCTORATE DEGREES[1]

Field of Study:	Average Monthly Salary Bachelor's	Master's	Doctorate	Probable or Definite Job Commitment[2]
Engineering	$1,410–$2,458	$1,800–$2,667	$2,583–$3,625	77.2%
Humanities	900–1,958	1,083–2,250	—	78.3%
Life Science	923–1,935	—	—	78.0%
Management	1,083–1,916	1,500–3,000	—	91.5%
Physical Science	1,114–2,333	2,200–2,720	2,416–3,333	80.0%
Social Science	888–1,833	1,050–2,291	—	69.4%
Medicine[3]	—	—	1,423	100.0%
Dentistry[3]	—	—	2,433	81.3%

[1]Source (except for Medicine and Dentistry—see footnote[3]): A national survey of a representative group of colleges conducted by the College Placement Council, representing the 80 percent range of offers for 1982–83 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.

[2]Source: *The Job Market for UCLA's 1983 Graduates.* Percentages are based only upon those students who planned to work immediately after graduation. Management job commitment figures are for students earning master's and doctorate degrees. Medicine and Dentistry figures are drawn only at the doctoral level. All other category percentages are based on students earning bachelor's, master's, or doctorate degrees.

[3]Source: *The Job Market for UCLA's 1981 Graduates.* Percentages are based only upon those students who planned to work immediately after graduation. Medical and dental salaries are shown as means rather than ranges. The medical mean is derived from a range of resident salaries.

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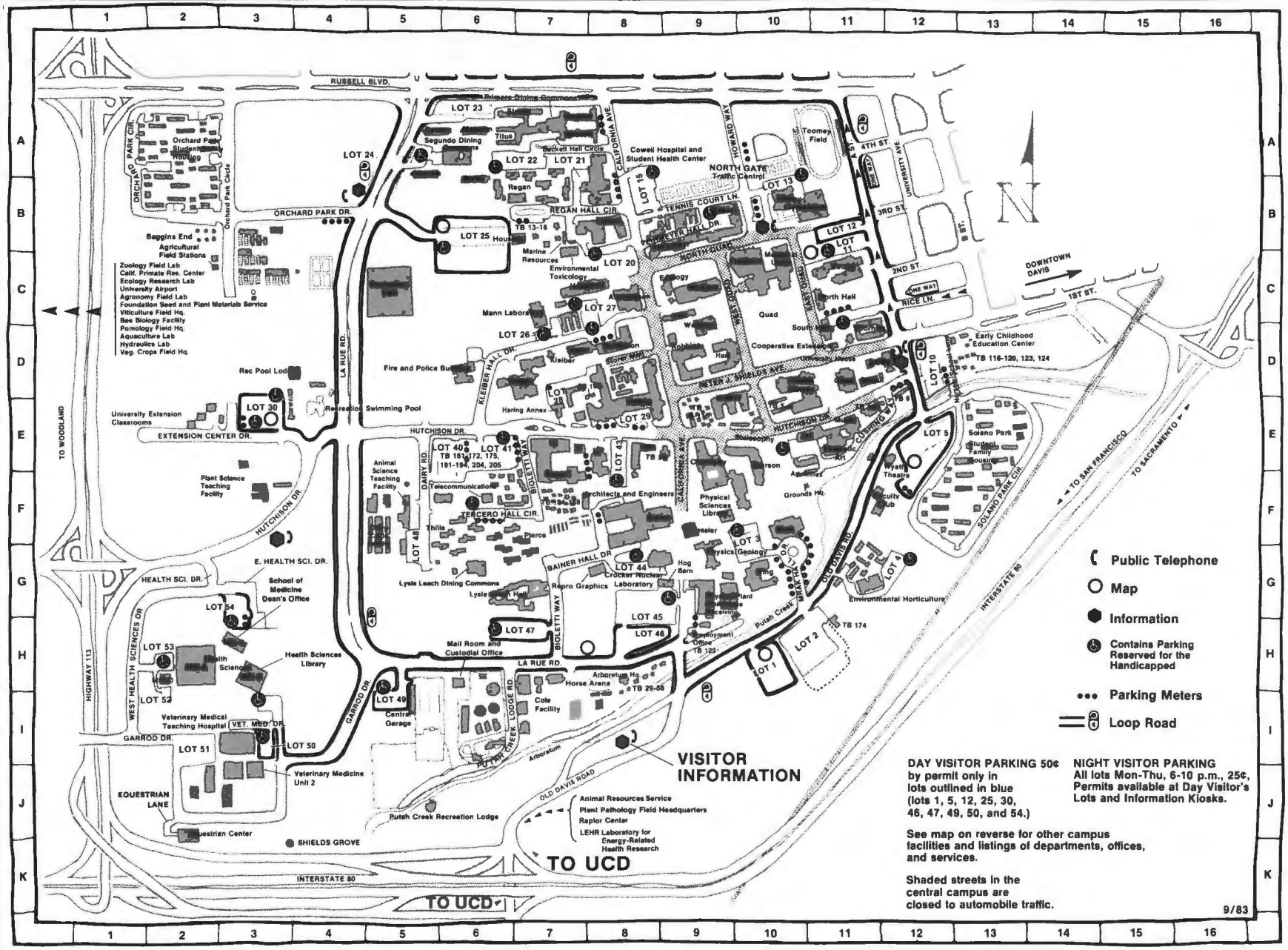

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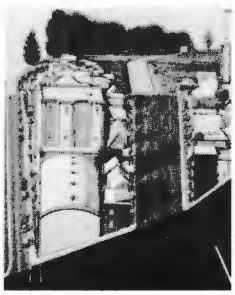

ON THE COVER

Wayne Thiebaud, **Holly Park Ridge**, (1979-80) oil on canvas; 26 x 22". Collection of Mr. and Mrs. Charles Campbell.

THE ARTIST

Wayne Thiebaud
b. 1920, Mesa, Arizona. **Studied** at Sacramento State College (B.A., 1951; M.A., 1952). **Taught** at Sacramento City College (1957-59). Professor, Department of Art, UC Davis (1960 to present). Lives in Sacramento and San Francisco, California. First **one-person show** at E.B. Crocker Art Gallery, Sacramento (1952). Subsequent solo exhibitions include the San Francisco Museum of Art (1961); the M.H. De Young Museum, San Francisco (1962); Allan Stone Gallery, New York (1962, 1963, 1964, 1967, 1974, 1977, 1978, 1979, 1982); the Nelson-Atkins Museum, Kansas City, Missouri (1966); Pasadena Art Museum (1968); Phoenix Art Museum (1976; retrospective; traveled to Oakland Museum, 1977); San Francisco Museum of Modern Art (1978); "Wayne Thiebaud: Painting," Walker Art Center, Minneapolis, Minnesota (1981; traveled); "Wayne Thiebaud," Art Museum of Santa Cruz County, Santa Cruz, California (1982); "Wayne Thiebaud: Paintings, Drawings, Graphics 1961-1983," The Trout Gallery, Dickinson College, Carlisle, Pennsylvania (1983; retrospective); "Wayne Thiebaud: Landscapes and City Views," Crocker Art Museum, Sacramento, California (1983). Selected **group shows** include "Pop Art," 1961 Biennial, Sao Paolo; The Arts Council of Great Britain, Hayward Gallery, London (1969); "Documenta," Kassel, Germany (1972); "Twenty-Five Years of American Painting 1948-1973," Art Center, Des Moines, Iowa (1973); "Separate Realities," Los Angeles Municipal Art Gallery, Barnsdale Park, Los Angeles (1973); "Painting and Sculpture in California: The Modern Era," San Francisco Museum of Modern Art and National Collection of Fine Arts, Smithsonian Institute, Washington, D.C. (1976-77); "Contemporary Naturalism: Works of the 1970's," Nassau County Museum of Fine Art, Rosly, New York (1980). "Contemporary American Realism Since 1960, "Pennsylvania Academy of the Fine Arts, Philadelphia (1981; traveled).

University of California
Davis, California 95616

Second Class