

UC/DAVIS
General Catalog

1988-89



HOW TO USE THIS CATALOG

The *UC Davis General Catalog* is a source of information about the Davis campus course offerings, academic programs, campus facilities, services, fees, requirements, and campus life. 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 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.) There is a list of major publications and where you can request them in the Appendix.

The *Catalog* is divided into four major sections:

- Information about the University and the campus, student services, fees, admission, and scholastic and degree 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 in the Appendix. 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, 117 Mrak Hall).

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

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

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UC/DAVIS

General Catalog 1988-89





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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

School of Law

1011 King Hall
 752-0243

Graduate School of Management

308 Voorhies Hall
 752-7362

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-IV
 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

Law: School of Law Admissions
 115 King Hall
 752-6477

Management: Graduate School of Management
 311 Voorhies Hall
 752-7399

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 Assistantships

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

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

News Service

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 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)
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Credits (inside back cover)



CALENDAR

Academic Calendar*

	FALL 1988	WINTER 1989	SPRING 1989	FALL 1989
● Pick up registration and course enrollment materials (all continuing students).	June 2-Aug. 5	Nov. 9-11 (1988)	Feb. 8-10	
● Faculty advisers available to all students.	June 2-3	Nov. 14-15	Feb. 16-17	
● Turn in course enrollment forms and student data card (all continuing students).	June 2-Aug. 5	Nov. 9-15	Feb. 8-17	
● Turn in fees along with fee statement (all continuing students).	June 2-Aug. 19	Nov. 9-23	Feb. 8-Mar. 3	
● Quarter begins.	Mon., Sept. 26	Tues., Jan. 3	Thurs., Mar. 30	
● Orientation and testing.	Sept. 26-28	Jan. 3-4	Mar. 30-31	
● In-Person Registration.	Sept. 26-27	Jan. 3-4	Mar. 30-31	
● In-Person Enrollment.	Sept. 28	Jan. 4	Mar. 31	
● Instruction begins.	Thurs., Sept. 29	Thurs., Jan. 5	Mon., Apr. 3	
● Final day of late registration.	Wed., Oct. 12	Wed., Jan. 19	Fri., Apr. 14	
● Final date to file petitions to change status from part-time to full-time student, or vice versa.	Oct. 12	Jan. 19	Apr. 14	
● Final date to file petitions to add courses to study list without paying a \$3 service fee.	Oct. 12	Jan. 19	Apr. 14	
● Final date to file petitions for PELP.	Oct. 12	Jan. 19	Apr. 14	
● 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., Nov. 2	Thurs., Feb. 9	Fri., May 5	
● Final date for undergraduates to file petitions with the Dean of their college or school to take courses on a P/NP basis. Exceptions rarely approved.	Nov. 2	Feb. 9	May 5	
● Final date for graduate students to file petitions with the Dean of the Graduate Division to take courses on a S/U basis.	Nov. 2	Feb. 9	May 5	
● Final date to file Independent Study Program project proposal form with the Academic Senate Committee on Courses of Instruction.	June 3	Oct. 12 (1988)	Jan. 19	Apr. 14
● Instruction ends.	Fri., Dec. 9	Thurs., Mar. 16	Fri., June 9	
● Final examinations.	Dec. 12-17	Mar. 18-24	June 10-16	
● Quarter ends.	Sat., Dec. 17	Fri., Mar. 24	Fri., June 16	
● Commencement.			Mid-June	
● Academic and Administrative Holidays.	Thurs-Fri., Nov. 24-25 Fri.-Mon., Dec. 23-26 Fri.-Mon., Dec. 30-Jan. 2	Mon., Jan. 16 Mon., Feb. 20 Mon., Mar. 27	Mon., May 29	Tues., July 4 (Summer) Mon., Sept. 4 (Summer)

Candidates for Degrees Undergraduates

● Filing period for those who expect to complete work for bachelor's degree to file an Announcement of Candidacy with the Registrar.	Aug. 22-Oct. 7	Nov. 28-Jan. 13 (1988-89)	Feb. 27-Apr. 7	June 5-July 7 (for Sept. '89)
● 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.	Fri., Oct. 7	Fri., Jan. 13	Fri., Apr. 7	Fri., July 7 (for Sept. '89)
● Final date for Letters and Science students who plan to complete work for a minor program to file applications with the Dean's Office.	Fri., Oct. 7	Fri., Jan. 13	Fri., Apr. 7	Fri., July 7 (for Sept. '89)

*Dates are subject to change and should be checked with appropriate *Class Schedule and Room Directory*.
Note: Thursday, March 16, treated as Monday for class schedule purposes.

Graduate Students

	FALL 1988	WINTER 1989	SPRING 1989	FALL 1989
● 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. 3	Fri., Jan. 13	Wed., Mar. 1	Thurs., June 1 (for Sept. '89) Mon., Oct. 2 (for fall '89)
● Final date for candidates for master's degrees to file theses with the committee in charge.	Tues., Nov. 1	Wed., Feb. 8	Mon., May 8	Mon., July 24 (for Sept. '89)
● 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. 16	Fri., Mar. 24	Fri., June 16	Fri., Sept. 15 (for Sept. '89)
● 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.	Mon., Aug. 15	Mon., Nov. 14 (1988)	Wed., Feb. 1	Mon., May 22 (for Sept. '89) Tues., May 23 (for fall '89)
● 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. 3	Mon., Jan. 9	Mon., Apr. 3	Mon., July 3 (for Sept. '89)
● 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.	Thurs., Dec. 1	Wed., Mar. 1	Thurs., June 1	Fri., Sept. 1 (for Sept. '89)

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 (1987)	July 31 (1988)	Oct. 31 (1988)	Nov. 30 (1988)
● 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 (1988)	Jan. 1	June 1
● Applications for admission to the Graduate School of Administration for 1989-90 must be filed with the School on or before this date.				Apr. 1
● Applications for admission to the School of Law for 1988-89 must be filed with the School on or before this date.				Feb. 1
● Applications for admission to the School of Medicine for 1988-89 must be filed with the School on or before this date.				Nov. 1 (1987)
● Applications for admission to the School of Veterinary Medicine for 1989-90 must be filed with the School on or before this date.				Nov. 1 (1988)
● Applications for readmission to undergraduate status must be filed with the Registrar on or before this date.	Fri., Aug. 26	Fri., Dec. 2 (1988)	Fri., Feb. 24	Fri., Aug. 25
● Applications for readmission to graduate status must be filed with the Graduate Division on or before this date.	Mon., Aug. 1	Tues., Nov. 1 (1988)	Wed., Feb. 1	Tues., Aug. 1

Financial Aid Deadlines

● Applications for grants, loans, work-study, and California Student Aid Commission awards for 1989-90 must be filed with the College Scholarship Service during this filing period for on-time consideration.				Jan.1-Mar. 1
● Applications for President's Undergraduate Fellowships for 1988-89 must be filed with the Scholarship Office on or before this date.				Fri., Nov. 4 (1988)
● Applications for fellowships and graduate scholarships for 1989-90 must be filed with the Graduate Division on or before this date.				Jan 15

Introduction



THE DAVIS CAMPUS

Theodore L. Hullar, chancellor of UC Davis, administers this campus of 20,800 students, and more than 1,600 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 Law, Management, Medicine, and Veterinary Medicine. Approximately 5,400 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. Students interested in reviewing the accreditation documents may do so by scheduling an appointment with the Office of Vice Chancellor—Academic Affairs, Mrak Hall.

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 Management 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), a \$25,000 prize for undergraduate teaching and scholarly achievement (believed to be among the largest of its kind in the nation), 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 20 general research universities in the United States.

The Setting

The Davis campus lies adjacent to the city of Davis (population 42,000), 15 miles west of Sacramento and 72 miles northeast of San Francisco. Sacramento, with all its resources as the state capital, is only 20 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 usually above freezing. It rarely 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. Approximately 36 miles of bike paths and 40,000 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

Introduction

I do not regret making UCD my choice. This campus has many strengths, especially in advising services, athletic programs and general education. The campus is beautiful year round. I have made many good friends and I have many good memories. Thank You, UCD.

*Sentor,
Biological
Sciences*

Introduction 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.

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 20,800 students, its style remains friendly, informal, and personal. As the campus moves through the eighties, a special effort is being 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 18 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 20,000 people only 20 years ago, the population of Davis stands today at over 42,000.



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—the newest is the four-story Food and Agricultural Sciences building completed in 1987—contrasting with the older, original wooden structures from the University Farm days. The first building on campus, University House, is still in use as the Gifts and Endowments Office.

The spirit of the campus's 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 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 157,000 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 20 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 1988, 33 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 composing 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 General Library at the University of California, Davis, is comprised of the Peter J. Shields Library, the Physical Sciences Library, the Agricultural Economics Library, the Loren D. Carlson Health Sciences Library and the Library at the UCD Medical Center in Sacramento. There are also a number of specialized departmental libraries located on the campus, as well as an independent Law Library.

The libraries contain over 2,100,000 volumes and receive about 50,000 periodical and journal titles annually. Resources in the natural sciences and the agricultural sciences are outstanding, and there are strong collections in the humanities, fine arts, social sciences, and engineering as well. The UC Davis libraries rank twenty-third among the ninety-nine academic libraries in the United States and Canada which make up the Association of Research Libraries. In addition to the book collections, there are over 2,400,000 items on microcopy, 200,000 maps, 586,000 pamphlets, and 13,000 sound recordings.

Shields Library serves as the main library for the campus and houses, in open stacks, the collections in the humanities, arts, social sciences, biological sciences, and agricultural sciences. *Service units* in Shields Library include the Departments of Humanities/Social Sciences, Biological/Agricultural Sciences, Government Documents, Special Collections, Access Services, the Periodicals Room, the Interlibrary Loan Service, and the Reserve Book Room. Shields Library also houses the General Library's administrative offices and the technical processing departments.

Shields Library is an official depository for Federal and State publications, and the Government Documents Department provides services which make it easier to use these materials. Current issues of journals and newspapers, some 7,000 titles, are housed in the Periodicals Room and are available for library use only. The Reserve Book Service lends, on a short-term basis, items which are assigned for class readings. The Department of Special Collections houses rare books, manuscripts, photographs, and pamphlets supporting research in the arts and humanities. Special subject strengths include nineteenth-century British literature, American avant-garde poetry, the performing arts, and the history of agriculture, technology, and rural life. Special Collections also administers University Archives, which includes UC Davis theses and dissertations, and the Michael and Margaret B. Harrison Western Research Center, a 17,000 volume collection that documents the history and development of the trans-Mississippi West from the mid-nineteenth century to the present, with particular emphasis on the American Indian. Other facilities in Shields Library include a browsing collection for recreational reading, audio-visual equipment, typewriters, a graphic arts loan collection, and copying machines at various locations.

The collections of the Physical Sciences Library, consisting of over 220,000 volumes, support teaching and

research in engineering, computer sciences, physical sciences, and mathematics. The library maintains a collection of almost 850,000 research reports of the U.S. Department of Energy, the National Aeronautics and Space Administration, the Nuclear Regulatory Commission, and other governmental agencies. The Carlson Health Sciences Library serves the Schools of Medicine and Veterinary Medicine with a collection of approximately 220,000 volumes. The Agricultural Economics Library holds more than 7,000 bound volumes and 241,000 unbound pamphlets in this field. The Library at the UCD Medical Center provides a clinical collection of 21,000 volumes.

The use of most library materials has been made easier by an automated circulation system. The MELVYL online catalog contains complete holdings for the Physical Sciences, Carlson Health Sciences, and the Law Libraries, and records for most of the Shields Library collection, including all books added since 1977. It also provides access to some library materials located on the eight other campuses of the University.

Interlibrary loan services allow borrowers to obtain materials from libraries throughout the University and from all over the world.

I truly enjoy the environment of the campus. All the trees and plants add to its beauty.

***Freshman,
Biological
Sciences***



The libraries provide orientation and assistance in using the various collections. Audiotape walking tours and lectures on the resources of the libraries are part of the Educational Services Program. Three courses for credit are offered: "Introduction to Library Research and Bibliography" (English 28), "Library Research Resources and Methods in the Biological and Agricultural Sciences" (Entomology 298), and "Biomedical Information Resources and Retrieval" (Epidemiology and Preventive Medicine 401).

A valuable research tool is the Automated Information Retrieval Service (AIRS), which is available in Shields Library's Humanities/Social Sciences, Biological/Agricultural Sciences, and Government Documents Departments, and in the Physical Sciences, Carlson Health Sciences and Medical Center Libraries. This service connects local terminals to computerized databases which provide information and bibliographies of periodical literature and other publications of the last 20 years, often including abstracts, in almost all subject areas. Numeric information and literary or other texts are available in some fields. Most databases also provide selective dissemination of information (SDI) to help researchers regularly update their knowledge. There is a charge for AIRS services.

Specialized equipment to facilitate library use by disabled patrons is available in most libraries on campus. Telephones designed to communicate with hearing-impaired persons are available in Shields, the Physical Sciences, and Carlson Health Sciences Libraries. A Kurzweil Reading Machine, which converts printed text to spoken form, is located in the Reserve Book Room in Shields Library, while additional equipment for vision-impaired users is available in the other libraries. The libraries cooperate with Services to Handicapped Students in providing this equipment and a selection of materials in braille. Users requiring other accommodations because of disability are encouraged to inquire at any reference desk; the libraries are committed to a policy of service to borrowers with special needs.

Some books from the Shields and Physical Sciences Libraries are now located in the Library Annex (in Surge II) and may be used there or delivered to another campus library on request. Some less-used library materials are located in the Northern Regional Library Facility, operated by the four UC campuses in northern California. All volumes are accessible within 48 hours by leaving a request at the Loan Desk in the Shields, Physical Sciences, or Carlson Health Sciences Libraries.

Daily intercampus bus transportation between the Davis and Berkeley campuses is available to facilitate library research and other scholarly activities. Information about reservations and cost for these buses is available in departmental offices or from the Central Garage.

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 120 acres, along a pond on Putah Creek's abandoned north fork, providing materials for teaching and research. The plants are attractive dry-land trees and shrubs. The acreage includes paths and picnic tables for recreation.

Outstanding plant collections are represented by the oaks in the Shields Grove, the California native trees

Introduction

and shrubs (also represented in the Mary Watis 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 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.

Also, the Arboretum administers the Putah Creek Riparian Reserve, about 150 acres of riverine woodland and wildlife along some three miles of the constantly flowing south fork of Putah Creek. This area has great potential for research and education.

Work-learn internships and work study for Davis students are available through the Arboretum in botany, horticulture, landscape architecture, 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. Primary research activities include studies of comparative farm policy, the history of farm land values, the causes and consequences of agricultural mechanization and other sources of productivity improvements in the nineteenth and twentieth centuries, and the impact of scientific research.

The Center was founded in 1964 and edits *Agricultural History*, the journal of the Agricultural History Society. The Center also oversees a 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 (CPRC) investigates selected human health problems for which the nonhuman primate is the animal model of choice. Research programs include developmental and reproductive biology, fetal and neonatal medicine, respiratory diseases, virology and immunology, and a variety of biomedical collaborative re-

search projects. A major theme of the CPRC is the study of environmental influences 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 health of the colony and for research on spontaneous diseases.

The Center, established in 1962, is supported by a grant from the National Institutes of Health. Many of the projects occurring at the center are funded by grants and contracts from a wide variety of extramural sources.

The facilities and training programs of the Center are currently being used by 34 core and collaborative faculty members, over 50 affiliate scientists, more than 50 undergraduate and graduate students, visiting scientists, and approximately 120 technical and supporting staff members.

The Campus Writing Center

Temporary Building 116
752-8024/8244

The Campus Writing Center is a campuswide program designed to provide writing instruction across the curriculum and to assist faculty and teaching assistants with the writing component of General Education courses. Its primary means of accomplishing this goal are through

- Adjunct writing courses, and
- Writing workshops.

Adjunct writing course sections (English 102) are offered for credit to students who are simultaneously enrolled in one of these courses and in a subject-matter course it is paired with. English 102 provides instruction in expository or scientific writing and assists students with research and writing skills appropriate for the field of study involved. Topics of instruction and writing assignments in each adjunct course pertain to the subject matter of the companion course.

The writing workshops are available upon request by faculty members or teaching assistants. The workshops focus on specific aspects of academic writing and are adapted to meet the needs of any field. In particular,



workshops are designed to offer training and help to professors or teaching assistants in General Education courses who have responsibility for assigning, correcting and evaluating student papers. Workshops are also conducted (upon the request of faculty members) for undergraduate students writing essay examinations or term papers.

The Campus Writing Center is affiliated with both the Office of the Vice Chancellor, Academic Affairs, and with the English Department.

Computing Services

Surge II
752-0233

Computing Services, with main offices at Surge II, serves the campus for batch, interactive timesharing, and remote job entry computing. Its 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 Dispatch Counter in the basement of Hutchison Hall, 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 and individual study courses are funded separately.

Computers operated by the Computing Services include: a Unisys A10FX, the primary administrative computer; four Digital Equipment Corporation (DEC) PDP 11/70 systems, three DEC VAX 11/785s, and four VAX 11/750s for academic use. These systems support over 150 terminals located in six student terminal rooms, plus over 3,000 additional terminals/microcomputers located throughout the campus. One of the terminal classrooms is designed primarily for teaching interactive graphics and is equipped with twenty-four color graphics terminals. 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 are six microcomputer classrooms with a combination of over 130 IBM PC compatible and Macintosh computers.

The computer systems 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 Center also operates a Remote Computing Station in Mrak Hall for administrative users and a Data Entry Group for key-to-disk entry of data into the computer systems.

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 un-



dertaken by faculty, graduate students, and Extension specialists; a colloquium series; and a newsletter, in addition to a core research program. The Center also houses a library containing books and periodicals on consumer-related topics.

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

Early Childhood Laboratory

Temporary Building 117
752-2888

The Early Childhood Laboratory (ECL) is sponsored by the Human Development and Family Studies unit in the Department of Applied Behavioral Sciences to provide a facility where students enrolled in Human Development courses, can develop observational techniques and participate with peers, children, parents, and professionals in an early childhood program. The faculty help students link theory and practice, develop a recognition and respect for individual differences, and consider their interaction and communication styles. Selected graduate students and faculty also conduct research at the Laboratory.

Four Laboratory programs accommodate children from ages six months to five years for three hours a day, following the academic calendar. Tuition is lower for UCD student families than for UCD staff, faculty, and community based families. A county program for children with special needs is housed at the ECL facility, and children and staff from both programs mix as frequently as possible. Information about the ECL and enrollment procedures can be obtained by telephoning 752-2888 in the mornings or writing to ECL, Department of Applied Behavioral Sciences.

Veterinary Medicine Teaching and Research Center (VMTRC)

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

The facilities of the VMTRC at Tulare were occupied in January, 1983. Located in a region of the state that has concentrated, diversified livestock production enterprises, the Center has developed 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 for Advanced Instrumentation supports research and instructional programs in electron microscopy, mass spectrometry, and morphometrics. The electron microscope laboratory houses scanning and transmission electron microscopes adjacent to a specimen preparation laboratory. Instruction in the theory and operation of the electron microscopes is provided by a unique autotutorial system and hands-on sessions with the microscopes. Morphometric analysis is supported by a computerized digitizing tablet and a digitizing video image analysis computer. The mass spectrometer laboratory consists of a quadrupole mass spectrometer and a high resolution double-focusing instrument. Both mass spectrometers have soft ionization and high mass capabilities and are interfaced to gas chromatographs and data acquisition systems. Instruction in the theory and operation of the mass spectrometers is offered throughout the year. Facility staff are available to teach students to use facility instruments, consult with users regarding experimental design, prepare samples and specimens for analysis, and operate the facility's instruments.

The Facility also promotes and coordinates the shared use of major scientific equipment located in various campus departments, including electron microscopes, an electron microprobe, an x-ray fluorescence spectrometer, an x-ray diffractometer, a paleomagnetometer, a scintillation counter, a cesium irradiator, and a whole body counter.



Institute of Ecology

2132 Wickson Hall
752-3026

The Institute of Ecology was 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, or requiring advice on these subjects.

The Ecology Institute has a publication series and sponsors national and international activities, including organizing symposia and conferences. The Institute has management responsibility for the Jepson Prairie, Putah Creek, and Stebbins Cold Canyon reserves that are part of the UC Natural Land and Water Reserves System. 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

Established in 1962, The Institute of Governmental Affairs fosters research on a broad range of social science areas. There are currently eight research programs within IGA: applied macroeconomics and macro policy; applied public policy; East Asian culture and development; Pacific Rim studies; international conflict and arms control; rural human resources; government and politics; and productivity and quality control. The Institute also supports a wide array of public affairs programs, conferences, and seminars; provides specialized library services; oversees the Social Science Data Service; prepares and administers extramural grants; and offers research opportunities to graduate and undergraduate students.

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 proteolytic enzymes, the use of modified atmospheres for storage of seafood products, crustacea nutrition, carotenoprotein extraction as part of a project dealing with shellfish waste, and extracellular enzyme processing and production by a hydrocarbon-utilizing yeast.

Intercampus Institute for Research at Particle Accelerators

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

This Universitywide institute, established in 1977, conducts research that uses the unique facilities at national and international accelerator laboratories, particularly the Stanford Linear Accelerator Center, the Enrico Fermi National Accelerator Laboratory, the Japanese accelerator laboratory (KEK), and the German laboratory (DESY) in Hamburg. High-energy particle physics is the dominant area of research. The Institute also promotes seminars and lectures by visiting researchers at individual campuses.

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 damage studies, the effect of background radiation on computers, and historical studies. Isotopes produced by the variable-energy 76-inch cyclotron are used in clinical and research applications, including pioneering work in brain imaging. Teaching activities at the undergraduate, graduate, and post-doctoral levels are in biology, medicine, radiochemistry, and physics.

Institute for Environmental Health Research (IEHR)

Institute for Environmental Health Research
752-1340

The Institute for Environmental Health Research (formerly the Laboratory for Energy-Related Health Research) coordinates interdisciplinary research concerned with biomedical and toxicological problems related to exposure to chemical, physical, and biological toxic agents or to ionizing radiation. The overall aim of the research at the institute is to determine basic mechanisms of toxic effects and to predict human health hazards from continual exposure to realistic levels of toxic substances in the environment or at the workplace. Studies on toxic, radioactive, mutagenic, carcinogenic, and teratogenic compounds are carried out in special animal holding facilities. Central laboratories exist for analytical chemistry, radiochemistry, ionizing radiation detection and quantification, cell biology research, inhalation toxicology, and human epidemiology. The Institute houses major UC Universitywide programs in Toxic Substances and Occupational Health.

Serology Laboratory

Horse Bloodtyping Laboratory
Armstrong Tract
752-2211

Cattle Bloodtyping Laboratory
Armstrong Tract
752-7383

The Serology Laboratory was established in 1955 to provide blood-typing services for the animal breeding

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industry. The Laboratory is a self-supporting unit of the School of Veterinary Medicine; its facilities are available to students working towards M.S. and Ph.D. degrees in genetics, immunology, and comparative pathology.

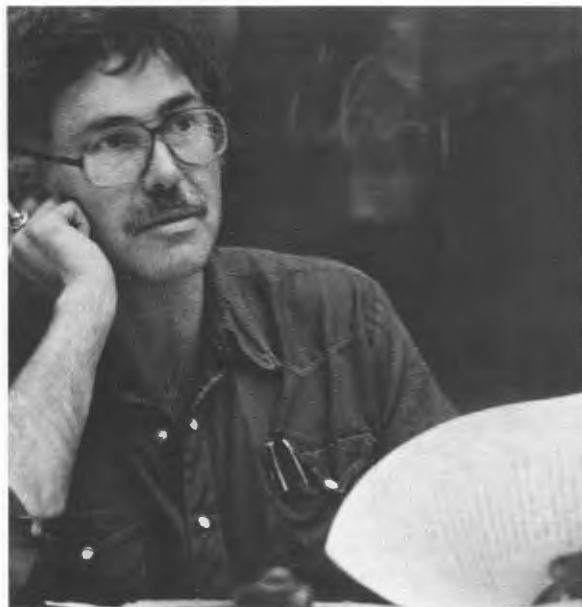
The Laboratory is recognized for its pioneering research on animal blood groups and biochemical polymorphisms. Current research activities of the Serology Laboratory include: investigation of red cell, serum, lymphocyte and DNA genetic markers which enhance the effectiveness of current techniques applied to parentage investigation and identification of cattle, horses, sheep, goats, llamas, and dogs; study of breed relationships through gene frequency analysis; application of blood typing tests to clinical veterinary medicine; investigation of the major histocompatibility complex (MHC) of cattle and horses and its role in resistance or susceptibility to a variety of diseases; study of the role of chromosome abnormalities in infertility; and investigation of the mode of inheritance of several suspected hereditary diseases.

The Laboratory works closely with the Equine Research Laboratory and the Livestock Diseases Research Laboratory, as well as with other departments, such as Animal Science.

Natural Reserve System

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

The University of California administers some 27 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. UC Davis administers three reserves in this system.



The campus is beautiful—the gardeners do an excellent job.

*Junior,
Art History*

Bodega Marine Laboratory

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

The Bodega Marine Laboratory is an organized research unit dedicated to research and teaching in marine biology and related fields. Research areas include biochemistry, physiology, genetics, microbiology, aquaculture and ecology. A variety of undergraduate courses are taught during the academic year and summer session. Although administered by the Davis campus, the Laboratory is located in Bodega Bay, Sonoma County, 100 miles west of Davis. The Laboratory is situated on 326 acres of varied habitats which comprise the Bodega Marine Reserve.

Jepson Prairie Reserve

Institute of Ecology
2126 Wickson Hall
UC Davis
752-6580

The Jepson Prairie Reserve is located fifteen miles south of the campus and is comprised of 1,566 acres of perennial bunchgrass grassland and vernal pools. The Jepson Prairie area is typical of habitats which once covered most of California's Central Valley and is recognized as the best remnant of native prairie land. Several rare or endangered species are endemic to the area.

Stebbins Cold Canyon Reserve

Wesley W. Weathers, Ph.D.
Department of Avian Sciences
3202 Food and Agricultural Sciences Building
UC Davis
752-1300

In 1979, the University purchased 277 acres of wildland in Cold Canyon as part of its Natural Reserve System. It is located twenty-four miles west of campus near Lake Berryessa. In 1984, 299 acres were added to the Reserve, which is named in honor of G. Ledyard Stebbins, professor emeritus 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.

Putah Creek Campus Reserve

Kerry Dawson
Environmental Design
UC Davis
752-2498

The UC Davis Arboretum also administers a campus nature reserve known as the Putah Creek Campus Reserve. Putah Creek and its south fork flow along the southern boundary of the campus with the reserve consisting of a 150-acre corridor along the north bank approximately 6 kilometers long and averaging 100

meters wide. Vegetation includes native and introduced species and generally reflects the perturbation that has occurred along the banks for several decades. The goals of the reserve are habitat conservation, education, research, and environmentally-directed recreation.

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 submaximal exercise testing, body composition analysis, and supervised exercise sessions.

Sustainable Agriculture Program: Student Experimental Farm

Information:
College of Agricultural and Environmental Sciences
752-7645

The Student Experimental Farm is an innovative teaching and research facility located on twenty-five acres of University land, and is the main focus of the Sustainable Agriculture Program. Since its inception in 1977, the Student Experimental Farm has provided students with unique opportunities to explore alternative agricultural technologies and philosophies through classes, special projects, internships, work study jobs, and original research.

The farm offers students numerous opportunities to gain practical experience in areas such as organic crop production, aquaculture, small animal husbandry, farm operations, and seed saving. In addition classes such as "Alternatives in Agriculture" and "Introduction to Sustainable Agricultural Systems" provide students with a chance to examine various agricultural issues in the classroom.

Because the farm includes several acres of land that

have been managed organically for over a decade, it provides researchers with a facility for conducting field research into sustainable agriculture. Whether interest is in organic or other farming systems, the farm can provide several services to facilitate student research projects.

Carnegie Institution of Washington, Department of Embryology, Davis Division

752-0210

The world-renowned Carnegie 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. 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

The free quarterly University Extension catalog contains the current list of continuing education programs offered in Sacramento and Davis. 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 University Extension courses include administration, agriculture, business and management, computer studies, education, engineering, environmental studies, graphic design, health and human services, labor relations, liberal arts, personal financial planning, toxics and hazardous materials management, wilderness recreation, international travel study, 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 organization.

COMMITTEE FOR ARTS AND LECTURES

Information:
104 Freeborn Hall
752-2523

The UC Davis Committee for Arts and Lectures presents a wide variety of performing arts events for the student and campus community and audiences throughout the greater Sacramento region. During the academic year the committee sponsors concerts and recitals by classical, jazz, avant garde and folk music artists; drama; classical, modern and ethnic dance; and lectures by

Introduction eminent public figures. Annually, the season features an average of more than one event a week.

Supported in part by student fees, the committee provides UCD students with ticket prices of up to 50 percent off for all performances. Student volunteers usher at many performances and help with promotional activities; student employees work as drivers, office assistants and stagehands. Students also serve on the Committee for Arts and Lectures, the chancellor's advisory committee composed of UCD staff, faculty and students which helps to select performing arts programs. Many Arts and Lectures events at UCD include free lecture-demonstrations, noon concerts and master classes for students. The committee also works with student groups such as ASUCD Student Forums and academic departments such as the Department of Music cosponsoring performances and lectures.

Annual and quarterly brochures and promotional materials for upcoming events are available through the Arts and Lectures office at the above location. Tickets for Arts and Lectures events may be purchased at the UCD Campus Box Office in Freeborn Hall.

CAMPUS EVENTS AND INFORMATION OFFICE (CEIO)

Information:
4th Floor, Memorial Union
752-2813

The Campus Events and Information Office provides a range of services to clientele seeking facility reservations, conference services, and special event presentations. CEIO is responsible for interpreting and applying campus policies related to the use of campus facilities. The staff of CEIO assists organizations in facility reservations and coordinating various services related to events. For further information contact this office at the above location.

The Information Services unit of CEIO provides general information regarding special events, campus tours, location of facilities, parking, etc. Information stations are located at 129 Mrak Hall (752-0539) and the Memorial Union lobby (752-2222). Questions pertaining to campus tours and tour programs should be directed to 129 Mrak Hall.

PUBLIC SERVICE RESEARCH AND DISSEMINATION PROGRAM

Information:
436 Mrak Hall
752-3224

The Public Service Research and Dissemination Program sponsors collaborative research efforts between faculty and government or private agencies on public policy issues. Research projects are solicited, reviewed and funded in the area of environment, agroecology, and children and family. Collaborators are encouraged to assist in the research process and are involved in dissemination of findings.

Seminars, conferences and publications are used to link faculty and decision makers and to establish change in research directions.

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. Although it is possible to complete up to 24 units by attending both summer sessions, 7 units per session is an average load.

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, France, and the Far East. 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 1989 there will be two six-week sessions at UC Davis: June 26 through August 4, and August 7 through September 15. 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, or in
- 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 experiences must emphasize learning rather than routine activities, and include field supervision by a qualified professional and, where appropriate, the faculty member responsible for giving credit.

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.

EDUCATION ABROAD PROGRAM

Information:

Education Abroad Program Office
323 South Hall
752-3014

Academic Information:

Carolyn F. Wall, Ph.D., Campus Coordinator
Dean's Office, College of Letters and Science
752-0392

The United Kingdom, Japan, Sweden, Norway, Mexico, Brazil, Hong Kong, Costa Rica, Ireland, Egypt, France, Austria, Taiwan, New Zealand, China, Germany, Italy, Korea, Israel, Spain, Kenya, India, Peru, the USSR, Australia, Portugal, Hungary, Togo, Thailand, Denmark, Canada, Indonesia, and Ghana.

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). The program is rapidly expanding; check with the EAP Office for additional locations available for study abroad.

Most EAP experiences are for undergraduates for an academic year. Exceptions are the one-semester programs in Leningrad (USSR), Nanjing (China), Hungary, the spring- or fall-quarter study and field experience program in Mexico, and the summer programs in Togo and 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 84 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 \$6,500 to \$9,500 (varies depending upon the country).

For study abroad during the 1989-90 academic year, the application deadlines are as follows: mid-November for the United Kingdom and Ireland, Japan, and the spring quarter programs in Mexico and Costa Rica; mid-May for Australia; and mid-to-late January for all other study centers. If you intend to participate in a study program during your senior year, careful advance planning is necessary to make sure that all degree requirements will be met. Consult with your major adviser, the Dean's Office of your college, and the campus EAP coordinator. For information on EAP centers and study programs, refer to EAP in the Programs and Courses section of this catalog.

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



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 4,500 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. Over 86 percent of the freshman students live in residence halls. Twenty-five percent of the transfer students elect to live in a residence hall environment. Freshmen who apply on or before April 1, 1988, are guaranteed residence hall housing as long as they complete all of the instructions which accompany their contracts.

The total room-and-board rate for 1988-89 is \$3,990 for a double-occupancy room and \$4,380 for a single room (of which there are very few available to new residents). Nineteen meals per week are provided. Rooms are furnished to provide each resident with a bed, desk and chair, bookcase, chest of drawers, study lamp, and bulletin board.

If the Davis campus is your choice when filling out your University Admissions Application, the necessary information and applications are mailed to you by the UCD Undergraduate Admissions Office.

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. At the time of publication, it was anticipated that the monthly rates for the academic year 1988-89 would be as follows:

- Orchard Park, two-bedroom unfurnished apartment, \$352.
- Orchard Park, two-bedroom furnished apartment, \$374.
- Solano Park, one-bedroom unfurnished apartment, \$264.
- Solano Park, two-bedroom unfurnished apartment, \$300.

Vacancies in Student Family Housing are filled from a chronological list based on the date of application. You should anticipate a wait of at least five months for a fall assignment (may be less at other times during the year). 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 vacancy 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 nor given over the telephone.

Other services of the Community Housing Office include: counseling and mediation of landlord/tenant and roommate grievances; educational programs; publications; liaison with fraternities, sororities, city government offices, and housing-related agencies in the community; and child care information and referral. This office also provides information on accessible housing to persons with disabilities.

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 a favorite weekly event during the school year. The Robert Bloch String Quartet and the UCD Faculty Woodwind Quintet are in residence on campus. 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 the Granada Artists-in-Residence program (which brings a major British director to the department each quarter), 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 special event; 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

Davis is a warm and comforting place to begin my college career. The atmosphere in the residence halls is very supportive.

*Freshman,
Psychology*

Student Life

corner of the campus to the other. The **Memorial Union Art 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 student-run **Basement Gallery** (752-0105 to leave a message) in the Art Building shows work by undergraduate UCD art students.

The **C. N. Gorman Museum** (752-6567), located in Temporary Building 111 (across from 194 Chemistry Building), was established in 1973 in honor of Carl N. Gorman, artist, advocate and former faculty member of Native American Studies on campus. The museum features changing exhibitions of works by contemporary Native American and other ethnic artists. Selections from the permanent collection of artifacts are also exhibited on a rotating basis throughout the year. The **Design Gallery** (752-6223) on the first floor of Walker

Hall, presents 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 Picnic Day student show.

The Committee for Arts and Lectures (CAL) brings a wide variety of performing artists to campus, ranging from internationally-acclaimed chamber ensembles to family entertainment spectaculars. In addition, CAL sponsors 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 News Service Office (752-1930) and *Special Events*, a monthly flyer distributed by the Campus Events and Information Office (752-1920) list upcoming activities. 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, an outdoor adventure, music listening, arts and crafts, bowling, 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 MU Games Area will help you balance the academic demands at UCD with your leisure interests.



Memorial Union and Campus Recreation

Information:
Memorial Union 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, Union Square eateries, and the Lifestyle Information Network.

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. Freeborn Hall is a recently renovated 1,650-seat assembly hall used for dances, dramatic and musical events, banquets, lectures, and conferences. The Committee for Arts and Lectures Office and the Campus Box Office, where you can purchase tickets for campus events and cash checks, are in Freeborn.

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**, just south of the Silo Student Center and adjacent to parking lot 43, is an ideal place to channel your creative energy. Facilities are available on a drop-in basis, or passes may be purchased for more frequent use of the equipment and work space. Workshops and classes are offered each quarter in such varied crafts as woodworking, weaving, jewelry-making, art and graphics, auto mechanics, ceramics, photography, silkscreen printing, welding, leatherworking, and stained glass. More information 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 in horse care and stable management. The Equestrian Center sponsors clinics, horse shows, and a summer equestrian camp plus special

events, and also coordinates the Drill Team, Polo, and Equestrian Clubs for student participation. Telephone 752-2372/1730 for further details.

The **MU Art Gallery** and **Music and Periodicals Center**, adjacent to King Lounge on the second level of the Memorial Union, feature a changing series of contemporary and historical art exhibits throughout the school year. 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 for your listening pleasure. Further information regarding these services may be obtained by calling 752-2885/1730.

The **Games Area**, located below the UCD Bookstore, is a recreational facility consisting of a bowling center with pro shop, billiards room, video arcade, lounge, snack bar, and storage lockers. The Games Area conducts bowling leagues, classes, clinics, and tournaments for all ages from beginning through advanced skill levels. The facility is wheelchair accessible. Details are available by calling 752-2580/1730.

Outdoor Adventures, in Temporary Building 24 on the corner of California and Hutchison, 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. Classes, excursions and clinics in backpacking, rock-climbing techniques, white-water rafting, kayaking, sea kayaking, board-sailing, mountaineering, cross-country skiing, and other sports are offered throughout the year. Group rates and custom-designed trips can be arranged. Many special activities such as wilderness emergency-care clinics, white-water river guide training, slide presentations, and programs conducted by outdoor experts are also held. Stop in and share your own outdoor experiences! For more information call 752-1730.

The **Recreation Swimming Pool**, at the corner of La Rue Road and Hutchison Drive, is a large free-form pool with a separate wading pool, a bathhouse, shuffleboard courts, and an extensive grass area for sunbathing. The staff offers lessons to all age groups and arranges for special events such as "family nights." The pool opens for the season in April and closes in October. The **Hickey Gymnasium Pool** is also available on a limited basis for noontime 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 on La Rue Road, 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 large-screen TV. 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.

Student Life

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 752-2813. For more information, call 752-1900.

A special program of the Memorial Union, **the LINK**, (the Lifestyle Information Network)—promotes balanced, healthy living by "linking" people and their leisure interests with appropriate resources. Through referrals, information, and educational programs, the LINK demonstrates how leisure can improve one's health and satisfy important personal needs. The LINK is open weekdays in the MU lobby from 10 a.m. to 2 p.m. For more information about the LINK, call 752-LINK/1730.

Recreation Hall

Information:
Entrance 1B
752-6073

Recreation Hall is a multi-use arena available for intramural and informal recreation play, intercollegiate athletics, physical education classes, sports clubs, and special events. The tri-level facility has locker rooms; a flat running track; an equipment room; handball, racquetball, wallyball, and squash courts; a weight room with free weights, universals and a self-guided circuit training concept that utilizes hydraulic machines; main court areas for basketball, volleyball, and badminton;

and areas for martial arts, table tennis, gymnastics, aerobics, and dance.

Students can use Rec Hall facilities by showing their current, valid photo ID card. Nonstudents may purchase a privilege card at the Rec Hall to use lockers, equipment, and facilities. Patrons may also purchase a daily pass at the 1B entrance.

Numerous special events sponsored each year by the ASUCD, Entertainment Council, Committee for Arts and Lectures, and the campus are held in the 8600-seat Recreation Hall.

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

Intercollegiate Athletics, Intramurals and Club Sports

Information:
264 Hickey Gymnasium
752-0511

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



Although intercollegiate athletics at Davis is intended to benefit the campus by providing *esprit de corps*, its prime role is to provide personal development opportunities for as many non-scholarship student-athlete participants as facilities and resources permit. Currently, the program consists of varsity teams in eleven men's sports and nine women's sports. Membership affiliation is with the Northern California Athletic Conference and Division II of the National Collegiate Athletic Association. Approximately 1,000 students compete on varsity or junior varsity teams each year. The club sports program includes both recreational and competitive offerings involving thirty-seven sports with 1,100 participants per year, while the intramurals program provides competition in thirty-six sports and serves approximately 14,000 participants.

ASSOCIATED STUDENTS (ASUCD)

Information:
Executive Council Office
370 Memorial Union
752-3632

ASUCD Office
364 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 \$15 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 seven elected council members and the Council President and Vice President. The Council is the policy-making body for ASUCD and supervises all aspects of the association. The Council President is the chief administrative officer for ASUCD and is assisted by the Vice President who serves as the executive aide. ASUCD is the liaison for the undergraduate student body and represents the students with other universities, the Universitywide administration, The Regents, and the Davis city government.

Five **commissions** are subordinate bodies of the Executive Council, and assist the governing board with its decisions by researching legislation and making recommendations. Commission chairpersons are ex-officio members to the Council. Each commission also involves itself with various projects that relate to their specific area.

- External Affairs deals with off-campus concerns (City of Davis, The Regents, social responsibility, etc.).
- Internal Affairs recommends policies to improve the quality of nonacademic student life on campus.



The social activities, especially the movies and dances, along with intramural sports and Rec Hall provide a necessary release from the pressures of school.

*Freshman,
Electrical
Engineering*

Student Life

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

The **judicial branch** is comprised of two boards whose members are appointed by the President of ASUCD.

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

Information:
ASUCD Office
364 Memorial Union
752-1990

ASUCD operates more than fifty activities and services for UCD students. Information about these services can be found in the *Student Directory*, which combines details about ASUCD services and organizations and the 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 and The Paperworks, Homecoming, Student Forums, Entertainment Council, Whole Earth Festival, 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

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

There are about 250 registered student organizations at UCD which 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 Programs. 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.

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

The **Danzantes 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.

JUDICIAL AFFAIRS

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

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

Student Conduct and Discipline

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

A 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, sexual or other physical assault, threats of violence, forgery, theft, vandalism, hazing, 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

should be referred to the Coordinator of Student Judicial Affairs. If complaints cannot be resolved informally between 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, or another appropriate panel or hearing officer. The President of the University, through the Chancellor, has ultimate authority for the administration of student discipline.

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 be able to register, receive transcripts of record, or diplomas until you have met all University obligations.

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:
1st floor, South Hall
752-3000

Advising Services coordinates the student service groups listed below. Professional staff and more than 70 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 almost forty 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 108 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 general advising questions. The student advisers here can either answer your questions or put you in contact with others who can. The staff can give you advice and assistance from the point of view of someone who has "been there." The First Resort maintains a tutor listing and referral service, a 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. (Temporary

Building 98, across from the Chemistry building, 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 108 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-Graduate School Information and Referral Service** is a program available through Advising Services to assist students interested in M.A. or Ph.D. programs. Specific services include help in locating graduate school programs in specific fields, completing application forms and statements of purpose, and planning financial options. Advisers are available through the main Advising Services office, 108 South Hall, 752-3000.

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 108 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 education.

Associate Dean of Students

Information:
1st Floor, South Hall
752-3000

The Associate Dean of Students provides advising, referral and program development to meet the needs of undergraduate and graduate students, particularly women students. The Associate Dean intercedes with faculty, academic, and Student Affairs administrators on behalf of students in academic or personal difficulty; interprets policies and procedures for students and

Student Life

parents; and works with schools, academic administrators and individual faculty to assist students in meeting UCD academic requirements. This office also provides leadership and influences policy and program development in the administration of activities related to the special needs of women and graduate students.

Counseling Center

Information:
219 North Hall
752-0871

The Counseling Center offers confidential psychological, psychiatric and peer counseling services to students having problems which affect their academic progress and sense of well-being. Assistance is provided through a network of programs at three campus locations: North Hall, Cowell Student Health Center and The House. All services are funded through student registration fees. Counselors help students manage their personal concerns and appropriately face difficult and challenging situations. Students are encouraged to develop the personal insight, interpersonal skills, and strength of character expected of an educated person.

A variety of counseling services is available to meet the needs of a large, diverse student population. A multi-disciplinary staff from the fields of psychology, psychiatry, and social work provide short-term individual and group counseling, crisis intervention, consultation, and referral. In addition, career interest inventory, personality testing, and information about graduate school admissions tests and the Planned Educational Leave Program are offered. Two peer counseling programs, The House and EOP/SAA Information Office, provide professionally supervised peer counseling and referral services.

To make an initial appointment, students can telephone or come to the Counseling Center. Students, faculty or staff who have a concern about a student or desire assistance in making a referral, are encouraged to call the Center.

The House

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

Located in a two-story green house next to the Housing Office, The House is a peer counseling program of the Counseling Center. The setting provides an informal environment where students can receive confidential support, information, and referrals regarding personal or interpersonal problems. The facility is staffed by well-trained student volunteers and is professionally managed. Peer counselor training is offered on a quarterly basis. Applications are available at The House.

Students can receive assistance through individual peer counseling and a wide variety of workshops and support groups. Students are always welcome to come in and enjoy the quiet atmosphere, free tea and coffee, and tours of The House. No appointment is necessary and services are offered on a drop-in or telephone basis. The House is open seven days a week and is wheelchair accessible.

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

Information:
313 North Hall
752-3472

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

Most majors have a peer adviser to answer students' questions about the major or department activities or careers.

*Junior,
Animal Science*



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

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 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). Selected regularly admitted EOP/SAA students are encouraged to do so. 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: Educational Opportunity Program students, 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 also 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. The Financial Aid and the Work-Learn and Career Planning and Placement Center offer special reentry student 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 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 submit a medical history form, and evidence of rubeola and rubella immunity to the Health Center as part of registration.

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

- General outpatient care

Student Life

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

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

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 a fee. Enrollment in this program can be initiated only during the registration period at the beginning of each quarter or summer.

The services of the Health Center are available to student's dependents on a fee-for-service basis. Also a Health Insurance Plan for your spouse and children may be purchased at 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, sexually transmitted diseases, stress management, and drug and alcohol use. The program is located in the Student Health Center. Telephone 752-1151 or 752-6335 for information.

International Student Services (SISS)

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

UC Davis currently has a community of over 1,400 international students and scholars, from approximately 90 countries, who are studying, teaching, and doing research in a variety of fields. Assistance to this varied group is provided by the staff of Services for International Students and Scholars.

The functions of the SISS Office are to assist incoming international students and scholars in making preparations to come to the U.S., to provide orientation to the campus and community upon their arrival in Davis, to assist them in maintaining their legal status while at UCD, and to facilitate the international transfer of funds in order to maintain their academic endeavors. Also, immigration, personal, cultural, and financial advisement as well as 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 required to attend this program.

Careful budgeting is essential for international students. A minimum allowance of \$15,000 per year for a single student is recommended to cover nonresident tuition and fees, and living expenses. 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 for *twelve* months. It is 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 must 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
752-3184 (voice)
752-6889 (telephone device for the speech and hearing impaired)

If you have a 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 their disability in order to achieve maximum participation in campus life. You can establish a partnership with experienced SHS staff to accommodate your academic needs.

Academic and mobility resources for registered students with verified disability needs include the following:

- Specialized advising on adapted educational methods
- Funding and help to hire aides for instructional reading, writing, research, and access needs
- Sign language interpreting and communication assistance
- Compensatory strategies, alternative test formats for learning disabled students
- Educational support equipment—a reading machine; brailers, tape recorders, and television aids for visually impaired; amplification equipment for hearing impaired; and computer adaptations
- Priority registration and enrollment in classes
- Mobility advising and supplemental orientation for the campus environment
- Accessible campus transportation services
- Repair services for wheelchairs, mobility, and other specialized disability equipment

- Equipment loans for emergency needs, including tape recorders, electric carts, and wheelchairs
- Information and referrals for tutoring, sources of devices, transportation, etc.

Counselors can help you with disability management issues and career choices. 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.

Campus accessibility is excellent: practically all instructional, recreational and student facilities are wheelchair accessible. 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 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 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

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

To initiate a benefit claim, write or drop by at 200 Silo with your letter of admission. The office can give you the forms, information and advice to get your claim processed.

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 brings attention to and challenges the barriers that inhibit the inclusion, equal power, and advancement of women. The Center promotes an understanding of the evolving roles of women and men, and helps women develop their full potential. To this end, the WRRC can provide the UCD community with information and programs on the educational, career, and personal needs and interests of women. The WRRC's services are wide-ranging and include:

- Workshops, lectures, forums, conferences, and events on issues of particular interest to women
- Classes in communicating with confidence
- Peer- and professionally-facilitated support groups
- Resource files and referrals for mental health, health care, employment, housing, campus and community events, marital problems, legal rights, legislation, child care, sexuality, and other issues
- Original research on gender roles and women's concerns
- Competitive grants for student research on women or gender, awarded annually
- Research consultation (assistance with designing and conducting research on women and gender 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 roles, and a monthly newsletter, *Women's Writes*, are also services of the WRRC.

The Women's Studies major and minor programs are administered at the WRRC. For information and program advising, see the Women's Studies Program in the Programs and Courses section 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 staff. Student internships are available in legislative work, publicity, program planning, and research.

Student Employment

Information:
Student Employment Center
114 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 Ed-

What I like about UCD are the opportunities it provides to meet lots of people.

***Senior,
Political
Science***

Student Life 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 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 looking in January for summer employment.

All offers of employment are conditional, subject to presentation of documented evidence of personal identification and U.S. citizenship or your right to work in the U.S., as required by federal law (Immigration Reform and Control Act 1986).

The Center is open from 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:

- The quarterly *Working Times* publication which lists all programs and services offered students through WL/CPP
- 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 Guide*, 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 Community Housing Office distributes child care publications, coordinates child care information and referral services among a network of satellite campus units, and serves as the University's liaison with the City of Davis Child Care Services Office. For further information, contact Community Housing, 101 Student Housing Office or telephone (916) 752-2483.
- The City of Davis Child Care Services Office provides free child care resource and referral information, and administers the child care subsidy program. 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, licensed family

day care homes, licensed in-home provider and child care centers, and child care co-ops, playgroups, and other family-related services. It is located at 23 Russell Boulevard, telephone (916) 756-3747.

- The Financial Aid Office can assist student parents who qualify for financial aid with allowances for dependent children (food, clothing, housing, basic medical costs), direct child care costs (in-home provider or child care center charges), and unanticipated medical expenses. This office is located at 113 North Hall on campus, telephone (916) 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 six months to six years for three hours a day, following the UC Davis academic calendar. Student families pay a lower tuition than do UCD staff, faculty and community-based families. The laboratory is located on campus, and the office is in Temporary Building 117, telephone (916) 752-2888.
- For those living in on-campus Student Family Housing, parent associations in Orchard and Solano Parks sponsor low-cost cooperative playgroups. Morning sessions are held in each area for children ages two to five years. Participation is limited to Student Family Housing residents. For further information or referral, telephone (916) 752-4000, Orchard Park/Solano Park, Student Family Housing Office.
- The Russell Park Child Development Center is located on campus and offers a comprehensive program for infants through school-age children at competitive rates. Priority is given to residents of Russell Park student family housing. Telephone (916) 753-2487 for further information.
- The Perfect Tender-Infant Care Cooperative serves six infants under twelve months of age for no fee. Participation is limited to School of Law student parents while they are attending classes throughout the academic year.



ALUMNI ASSOCIATION

Information:
The Alumni Center
Guilbert House
112A Street
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, Homecoming, Picnic Day, the UCD Annual Giving Program, legislative relations programs, student recruitment, career networking, and a student loan fund. In addition, the Association maintains a professional staff dedicated to meeting the needs of UCD's more than 80,000 alumni.

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



Fees, Expenses and Financial Aid



FEES AND EXPENSES

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

While the needs and resources of each student are different, the following information will give you an idea of the basic expenses students at UCD will incur. Legal residents of California are not required to pay tuition at the University. Students classified as nonresidents must pay tuition of \$1,502 per quarter. (See the Appendix 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	\$197.00	\$197.00
Memorial Union	18.50	18.50
Associated Students fee	15.00	
Graduate Student Association fee†		4.50
Education fee‡	280.00	280.00
Total for California residents	\$510.50	\$500.00
Tuition for nonresidents‡	1,502.00	1,502.00
Total for nonresidents	\$2,012.50	\$2,002.00

These fees are for the 1988-89 academic year and are subject to change without notice.

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

†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.

Additional Fees and Expenses

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

Parking (per year: \$50 to \$60 for cars, depending on the type of permit; \$24 for motorcycles; \$36 for nighttime only permit, i.e., \$14 per quarter)

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

Late payment registration fee (\$50)

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

Transcripts (\$3 a copy)

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 *1988-89 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: \$197 per quarter; \$295.50 per semester for law students. Revenue from this fee is used to support a portion of the cost of student services programs including cultural and 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: \$280 per quarter for undergraduate and graduate students; \$421 per semester for law students. Revenue from this fee is used for financial aid and related student programs.

Nonresident Tuition: \$1,502 per quarter; \$2,253 per semester for law students (see the nonresident tuition fee statement in the Appendix).

Memorial Union: \$18.50 per quarter; \$27.75 per semester for law students. Paid by all students. This fee includes the student facility fee (beginning Fall 1988, revenue from this fee will be used toward planning and future expansion of student facilities on campus).

Associated Students Fee: \$15 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 Management, 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 1988-89 expenses of a single UCD undergraduate living off campus will total \$8,146, including \$1,536 for fees, \$589 for books and supplies, \$2,813 for housing, \$1,179 for food, \$1,538 for personal expenses, and \$491 for transportation. Estimated expenses for other single students living off campus are: graduate students, \$7,998; Graduate School of Management, \$8,371; Law, \$8,271 to \$9,377, depending upon the year in school (first, second, etc.); Veterinary Medicine, \$8,503 to \$9,228, depending upon the year in school (first, second, etc.); Medicine, \$9,961 to \$12,008 depending upon the year in school. Married students are awarded aid based on the same basic budget as single students plus the addition of a standard child care allowance, unless documentation is provided of a spouse unable to work, in which case a dependent living allowance will also be awarded. Single parents are awarded a single student budget and a child care allowance. If a single parent's resources (earnings and benefits) are not sufficient to meet the basic living expenses of their dependents, a standard dependent living allowance may be awarded upon receipt of documentation.

Fees Expenses
and Financial
Aid

**My dream
since I was
a freshman
in high
school was
to attend
UC Davis.
Now that
I'm here, I
love it.**

*Freshman,
Biological
Sciences*

The 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

A transportation allowance is included in the cost of living estimates given above. A valid permit is required to park on the UCD campus. Information on automobile and motorcycle parking can be obtained through Parking Services located in the Transportation and Parking Office on Extension Center Drive directly south of Lot 30 and Recreation Pool (752-3729/7629). Parking for on-campus residents is limited. Car pools are encouraged and the information on ridesharing may be obtained by telephoning 752-MILE.

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 I.D. 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 in full except for the \$100 Acceptance of Admission Fee.

Day 1 and after, the \$100 Acceptance of Admission Fee is withheld from the Registration Fee and the Schedule of Refunds is applied to the balance of fees assessed.

All Continuing and Readmitted Students and New Graduate Students:

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

Schedule of Refunds

The Schedule of Refunds 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
113 North Hall
(916) 752-2390

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

To ensure priority consideration, you should file your application for the 1989-90 academic year as soon as possible after January 1, 1989. The priority filing deadline is *March 2, 1989*. Students who miss the priority filing date may not be able to receive funds to meet their full need. You are still encouraged to apply for financial aid, even if it is after the priority deadline; application processing will continue until funds are depleted. Application instructions for prospective undergraduate students are contained in the *UC Undergraduate Admissions and Financial Aid Packet*. The Student Aid Application for California (SAAC) is available at local high schools and this office. Continuing UCD students and prospective graduate students should obtain the SAAC and "Instructions for Applying for Financial Aid, 1989-90" from the UC Davis Financial Aid Office in December, 1988.

Undergraduates with outstanding academic records are encouraged to apply for scholarships. For information regarding the scholarship application process, see Scholarships and Awards at the end of this section. Contact the UCD Scholarship Office, 207 North Hall, (916) 752-2393 for further information.

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. State graduate fellowship eligibility is based on grade-point average, test scores, and financial need. Awards are applied directly toward fees. Annual awards are currently in the amount of \$954. A State Graduate Fellowship Supplement as well as a SAAC must be submitted to the College Scholarship Service by March 1, 1989.

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. **Regulations and deadlines are subject to change.**

Satisfactory Academic Progress

Federal regulations require that financial aid recipients maintain satisfactory academic progress. This means that you must meet quantitative (unit) and qualitative (grade-point average) standards as defined in the Scholarship Deficiencies section of this catalog. There

is also a limit on the number of quarters of enrollment that you are eligible to receive financial aid. A complete copy of the financial aid policy is available at the Financial Aid Office, 113 North Hall. Review the policy in detail and discuss it with your academic adviser.

TYPES OF FINANCIAL AID

Grants

A grant is gift aid that does not have to be repaid as long as eligibility remains. 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). All parts of the SAR must then be submitted to the UC Davis Financial Aid Office.

- Amount depends on financial need

Cal Grants are awarded by the California Student Aid Commission and may be renewed each year. All undergraduate financial aid applicants who are California residents are required to apply for one of these awards 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 a portion of the registration fees
- Cal Grant B pays a monthly stipend for living expenses for first-year students and a portion of the registration fees plus a monthly stipend for living expenses for second- through fourth-year students.

University Grants are available to both graduate and undergraduate students.

- Maximum varies each year depending on funds available

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

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

Bureau of Indian Affairs (BIA) Grants are awarded to students who are at least one-fourth American Indian, Eskimo, or Aleut, as recognized by a tribal group served

by the Bureau of Indian Affairs and who show financial need. Applicants must submit a 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 \$18,000 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.)

- \$4,500 undergraduate maximum for first 2 years
- \$9,000 undergraduate maximum during 4 years
- \$18,000 maximum for graduate students, including loans taken out as undergraduates
- 5 percent interest (subject to change)
- Repayment begins 6 months after graduation or withdrawal

Perkins (formerly **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 to nine months after graduation or withdrawal from school and may be extended over ten years. Under certain circumstances, additional deferments are 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.

- \$4,500 undergraduate maximum for first 2 years
- \$9,000 undergraduate maximum during 4 years
- \$18,000 maximum for graduate students, including loans taken out as undergraduate
- 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 and dependency status.

- \$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

As far as career services, the Minority Engineering Program and EOP have helped me tremendously. I don't know how I would manage without them.

*Sophomore,
Engineering*

- Repayment begins 12 months after receipt of the degree or withdrawal

Guaranteed Student Loans (GSLs) are available through banks and other lending institutions. These loans are based on financial need. Interest accrued while in school is paid by the federal government.

- \$2,625 maximum per year for freshmen and sophomores, \$4,000 maximum per year for juniors and seniors, to \$17,250 maximum cumulative indebtedness for undergraduate students
- \$7,500 maximum per year to \$54,750 maximum cumulative indebtedness for graduate students
- 7-9 percent interest (may change on short notice)
- Repayment begins 6 months after graduation or withdrawal

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

- \$20,000 maximum per academic year (or the financial need of the student, whichever is less)
- \$80,000 total maximum
- The HEAL Program does not provide a subsidy payment for interest
- Interest is set at 3 percent points above 91-day T-Bill rates
- Repayment begins 9 months after completion of formal training, including accredited internship and residency programs, or withdrawal

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

- Parents of (1) dependent undergraduate students or (2) dependent graduate/professional students may borrow \$4,000 per year up to a maximum aggregate of \$20,000 for each dependent student
- Independent undergraduate students or graduate/professional students may borrow up to \$4,000 per year, to a maximum aggregate of \$20,000
- 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 or emergency financial needs of registered students. Loan funds are provided by UCD alumni, ASUCD, the Cal Aggie Foundation, The Regents of the University of California, and private donors.

- Short-term loan: \$300 maximum; the full amount of in-state registration fees for one quarter may be borrowed in the form of a fee voucher. The maximum repayment period is 5 months.

- Emergency loan: \$100 maximum; payment is due in 30 days. Available on a drop-in basis, Monday through Friday, 10:30 to 11:30 a.m. and 2:30 to 3:30 p.m.
- 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. The maximum repayment period is six months.
- The application to apply for a Short-Term, Emergency, or Teaching Assistant Loan is available in the lobby of North Hall. For more information or to schedule an appointment, telephone (916) 752-6470, 10 a.m. to 12 noon and 2 to 4 p.m.

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 or off campus with profit or nonprofit organizations. 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.

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

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

SCHOLARSHIPS AND AWARDS

Information:
Scholarship Office
207 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 applying from high school), selection is based on letters of recommendation and a personal essay in which your University goals and objectives are stated. *Some awards may be limited to students in specific majors or colleges, residents of certain geographical areas, students of a particular class standing, or students with demonstrated financial need.* Most scholarships are not renewable and you must re-apply each year for scholarship aid.

Students applying to the University are considered for scholarships using the same forms completed for admission purposes. Announcement of winners is usually made beginning in mid-April.

Graduate students are also eligible for various scholarships and fellowships.

Regents Scholarships, among the highest honors that undergraduates at the University can receive, are granted to exceptionally promising freshmen or juniors enrolling in the Fall Quarter. Awards may be honorary (a \$500 per year award) or may be accompanied by a stipend generally covering the difference between family resources and yearly educational costs. 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 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 \$1,500

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

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

Fees Expenses
and Financial
Aid



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. The second step is to determine the admission category to which you belong. (See Explanation of Application Categories further on in this section.) 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. The final step is to arrange to have all supporting documents—official test scores and transcripts—forwarded as early as possible.

A summary of the steps in the application procedure appears on the next page. Use the checklist to follow your application through the admissions process.

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 Student Housing Offices since admission to the University does not guarantee the awarding of financial aid or housing.

The Services to Handicapped Students Office encourages applicants with a physical impairment to contact that office 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

Admission

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.

ADMISSION CHECKLIST

1. Obtain the undergraduate admissions packet from your high school, a community college, or a campus of the University of California. If you are not a California resident, request an application from the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, CA 95616.
2. Complete the application including the essay and list the college and major you prefer. Attach a check or money order to cover the Application fee with your application materials, and return them in the preaddressed envelope **during the priority filing period for the quarter in which you are interested.**
3. Retain for your records the notices received from both the Application Processing and the Undergraduate Admissions Offices which acknowledge receipt of your application.
4. If you are applying from high school, do not send a preliminary transcript unless requested to do so by Undergraduate Admissions. If you are applying as an advanced standing student, arrange to have all transcripts sent. If test scores are required, please arrange to have these forwarded by the testing agency.
5. High school applicants to the fall term should make arrangements to take the SAT or ACT and three Achievement tests by no later than December. It is highly recommended that these tests be completed by the November test date.
6. 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 (if required), work in progress, and test scores (if required), therefore it is important**

Admission to make arrangements for these requests if you want to avoid delay in the processing of your application.

- 7. Retain for your records the notification of admission received with your "Statement of Intent to Register" form.
- 8. Return your "Statement of Intent to Register," with the nonrefundable advance deposit of \$100 (if required), as soon as possible and no later than the date stated on the SIR so your registration materials can be ordered before you register.

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 at least four or five days in advance, either in person or by telephone.

PREPARING FOR UNIVERSITY WORK

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

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

Reading: You should become proficient in reading and understanding technical materials and scholarly works. 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 analysis and argument; c) choose words which aptly and precisely convey the intended meaning; d) construct effective sentences, i.e., sentences that economically and



successfully convey the writer's ideas and display a variety of structures; and e) demonstrate an awareness of the conventions of standard written English.

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

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

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

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

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

APPLICATION PROCEDURES

The UC Application System

Students seeking admission to the University of California are able to have their applications considered simultaneously at more than one campus.

Under this system, you submit one application to the University indicating the campus or campuses you wish to attend. The application is then forwarded to the campuses you list. For information regarding the filing fee, consult the application packet.

Undergraduate application packets may be obtained from any California high school, community college, or University of California Admissions Office. Complete the application materials following the instructions included in the packet. Communications concerning admission to the UC Davis campus should be sent to the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis 95616.

A nonrefundable application fee 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.

Initial filing dates are the same for all UC campuses and are listed below. All applications filed during the priority filing period will be accepted for consideration. The Davis campus may continue to accept applications beyond the initial filing period; however, after the priority filing period, some departments or colleges may close to new applicants as enrollment quotas are filled. Once a department or college has closed, any additional applications which are received will be notified of alternatives on other UC campuses by the Central Processing Office.

The initial filing periods for new applicants are as follows:

Quarter to be Admitted (All UC Campuses, Except Berkeley)	Opening Date of Filing Period	Semester to be Admitted (Berkeley Campus Only)
Winter 1989	July 1, 1988	Spring 1989
Spring 1989	October 1, 1988	
Fall 1989	November 1, 1988	Fall 1989
*Winter 1990	July 1, 1989	Spring 1990
†Spring 1990	October 1, 1989	

*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.

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

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 and other supporting documents to be sent to the Undergraduate Admissions Office as soon as they are available. High school students should not forward transcripts unless requested by the Undergraduate Admissions Office. Because advanced standing eligibility depends upon the final outcome of quarter or semester course work in progress, this office must receive a final official transcript of all work completed before you may register.

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 official transcripts to be forwarded and to ensure that they arrive promptly. It is also useful to have unofficial transcripts sent to you to retain for counseling purposes.

You must submit an official final transcript including a statement of graduation, a Certificate of Proficiency or a General Education Development (GED) certificate. Freshman applicants (see "Explanation of Application Categories") are also required to submit results of their SAT or ACT tests and three Achievement Tests. (Fall quarter freshman applicants must complete all tests by the December test date in order to be given priority in the admissions process.)

Admission

The quiet, calm atmosphere has made a big improvement in my study habits.

*Freshman,
Botany*



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

Addition of Campus Choice

If, after submitting your application, you wish to add a campus or campuses to the one(s) you first listed on your application, you may do so for a fee, if the campus(es) you wish to add is (are) still open to new applications. Contact the Admissions Office at the new campus(es) for their application status. If your application can be included, submit a request to the Central Processing Office in writing, stating your full name, social security number, application ID number, college, major, and term for entrance, and include the additional application fee and your signature.

Processing an addition of campus choice takes several weeks; however, your admission priority will be assigned based on the date your request for an addition is made. You should be aware that special program commitments, such as the EOP/SAA or UCLA's Academic Advancement Program, may vary from campus to campus.

If you desire housing or financial aid information, you should contact the "added" campus housing and financial aid offices about the campus's priorities, deadlines, and availability of financial aid and housing.

Notification

After submitting 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, the University will mail you a notice acknowledging receipt of your application; later, you will receive a letter notifying you of your admission status.

The length of time before admission notification varies, depending upon the completeness of your application. For example, most applicants for Fall Quarter will be notified of their admission status between February 1 and mid-March. They will then have until May 1 (as a freshman) or June 1 (as a transfer) to notify the campus that they wish to attend. Students not selected for admission consideration at all campuses to which they have applied may have their application considered at another UC campus where space is still available.



Acceptance of Admission

When you receive your notification of admission you will also receive an important form called the "Statement of Intent to Register" (SIR). You must fill out the form and return it to this office, along with the required non-refundable \$100 deposit, in order to complete the admissions process. This deposit is applied to your University Registration Fee as long as you register in the quarter to which you are admitted. Intercampus transfer, EOP, and readmission applicants (see Explanation of Application Categories below) are not required to submit the \$100 deposit; however, they will pay full Registration fees at the time of registration.

**Academically,
Davis is
superb.
UCD has
some really
outstanding
professors.**

*Senior,
Biochemistry*



A **readmission** applicant 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.

A **reentry** applicant is an undergraduate student age 25 or over or a graduate student age 30 or over who has had a significant break in education.

A **limited status** applicant 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 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.

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 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 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 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 (non-UC) 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 and applies as a readmit through the Davis campus Registrar's Office.

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



Admission **Employee-student status** is for a UC career employee who wishes to work toward a degree through the Employee Reduced Fee Program.

A **second baccalaureate** applicant 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 is a student who is not a U.S. citizen, immigrant, or refugee.

A **concurrent enrollment** applicant is someone 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. Such work may be used for admission consideration and for degree recognition. 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 Graduate Division section in this catalog.

A **professional school** applicant is a student who has completed the requirements necessary for admission to one of the professional schools on the Davis campus (Law, Management, 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. The **College of Engineering** focuses its curricula on the engineering sciences. 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.

Major programs are listed in each college section.

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**.

Subject Requirement

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

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

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

A. History—1 unit

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 units

Four years of English—composition and literature (university preparatory in nature, including frequent



and regular practice in writing expository prose compositions of some length). Not more than one year will be accepted from the ninth grade. (See English Proficiency below.)

C. Mathematics—3 units

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

D. Laboratory Science—1 unit

A year course in one laboratory science, taken in the tenth, eleventh, or twelfth grade.

E. Foreign Language—2 units

Two years of one foreign language. Any foreign language with a written literature and emphasis on the development of aural and oral skills may be used. (Courses taken in grades seven and eight may satisfy this requirement if they are accepted by the high school as equivalent to its own courses.)

F. College Preparatory Electives—4 units

Four units in addition to those required in "A" through "E" above, to be chosen from at least two of the following subject areas. Elective courses should involve considerable reading and aim to develop analytical and reasoning ability and skill with written and oral exposition.

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

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



school, the Undergraduate Admissions Office will determine if your courses 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 completing one of the following:

- 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 college-level English course with a grade of C or higher in literature, composition, or speech.

Scholarship Requirement

An applicant must have earned a grade of C or better in all high school courses to satisfy the "A" through "E" requirements above. The grades earned in these courses that are taken in grades ten through twelve will be used to compute the grade-point average for admission, *except that* the grades earned in the third year of mathematics required under the "C" requirement (intermediate algebra) will be used only if they improve the applicant's grade-point average.

Two of the four units in elective courses used to satisfy the "F" requirement must be completed with a grade of C or better, and all four units must be accepted by the high school for graduation. The best grades earned in any two of these units taken in grades ten through twelve will be used in computing the applicant's grade-point average for admission.

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 following 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 Board 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 December of your senior year (earlier testing is recommended). The following tests are required:

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

or

- American College Test

and

- Three Achievement Tests (College Board), 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



Admission

UCD is one of the best institutions in the nation. The professors and the level of teaching are superb.

*Junior,
Zoology*

*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.

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 of transferable college work since high school graduation, you can qualify for admission as a freshman by examination alone. (If you have completed transferable college courses, College Board tests cannot be taken in academic subjects covered in those courses.) You must take the same College Board tests discussed above and receive a total score of at least 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.

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.) UC Davis's College Board 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, excluding the summer immediately following high school graduation. An advanced standing student may not disregard his or her previous college records. Official transcripts from all previous colleges or universities must be submitted to Undergraduate Admis-



sions. This Office determines an applicant's status by looking at courses that are transferable to the University. Courses accepted for admission may not be accepted by the Dean of your college for meeting breadth, major, General Education, 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 later in this section under Nonresident Applicants.

The transcript you submit from the last college you attended must show, as a minimum, that you were in good standing and that you had earned a grade-point average of 2.00 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 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. (Note: Transfer students who graduated from high school at the end of the 1985-86 school year, or after, must meet the high school requirements for freshman applicants described earlier in this catalog. Transfer students who graduated from high school prior to the end of 1985-86 school year must meet different high school requirements. Contact the Undergraduate Admissions Office to discuss those requirements. Beginning fall 1989, all transfer students, regardless of the date of high school graduation, must meet the high school requirements stated earlier in this catalog.)

- 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. If you graduated from high school at the end of the 1985-86 school year or after, the sequence of courses must be at least equal to elementary algebra, geometry, and intermediate algebra or a course for which advanced algebra is a prerequisite. Starting Fall 1989, all applicants must meet this version of the mathematics requirement. Courses other than mathematics must be transferable to the University.

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 and/or educationally disadvantaged backgrounds. The program offers assistance with the admission application process in addition to providing academic, social and cultural support. (See also under Advising and Counseling in the Student Life section.) Financial aid and an admissions application fee waiver is available to those individuals with demonstrated financial need. You can contact the Undergraduate Admissions Office for information on obtaining a fee waiver.

An EOP/SAA 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.

To apply for the program each applicant must complete the regular UC admission application form and mark the appropriate places related to EOP. In addition, the applicant is advised to elaborate on personal circumstances in the required essay.

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 also under Advising and Counseling in the Student Life section.)

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

Admission apply for limited status admission you must either have a bachelor's degree but not be a candidate for an advanced degree, or have completed a substantial amount of college work with a satisfactory grade-point average. You will not be admitted to limited status for the purpose of raising a low scholarship average.

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

Admission to the College of Agricultural and Environmental Sciences 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 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. Applications are

available from any local high school, community college or UC campus. The nonrefundable application fee must be submitted with your transfer application. Filing dates are the same as those listed for regular applicants (see Calendar at the front of this catalog).

International Student Status

Applicants from other countries will be admitted in accordance with the general procedures governing non-resident admission. An application may be obtained by writing the Undergraduate Admissions Office, 175 Mrak Hall, University of California, Davis, California, 95616. Applicants who are not United States citizens, immigrants, or refugees, must return this application with the nonrefundable application filing fee. It is very important that the application be filed during the appropriate filing period. Applications received after the first month of the priority filing period will be processed as space permits.

Prior to admission, the Financial Certification Form is required to demonstrate the availability of \$15,000 for the first year's study. Adequate funding is required for the remaining years in the United States until the academic program is completed. Prior to registration, the signed Statement of Responsibilities for Privately-Funded Students, or the Statement of Responsibilities for Sponsored Students is required.

For applicants whose native language is not English or whose schooling has not been in the English language, the results of the Test of English as a Foreign Language (TOEFL) are required and must be submitted. To arrange a testing date and location in one's home country write to the Educational Testing Service, P.O. Box 899, Princeton, New Jersey, 08540. The minimum TOEFL score which will be accepted is 500.

Prior to registration, international students whose native language is not English are required to demonstrate sufficient command of the English language to profit from instruction at the University. A proficiency examination is given at UC Davis during the week before school begins. If students do not pass this examination, they must enroll in English classes for international students—English 21, 22, or 23—until they have acquired the necessary language skills. In addition, students must satisfy the University Subject A requirement.

As part of the application process, applicants are required to submit their 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. Credit will be granted for university studies outside the United States if the coursework has been completed in an approved university and is considered to be academically equivalent to coursework offered at the University of California. The Undergraduate Admissions Office will have the final authority for assessing the transferability of credit.

For additional information, look under International Student Services in the Student Life section of this catalog.

Most academic departments and special interest groups have a club to help you get involved.

*Junior,
Animal Science*

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 the Registrar's Office, 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 under fees and expenses.

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 (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, Schools of Law, Graduate School of Management, Medicine, or Veterinary Medicine, see the appropriate sections in this catalog.

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
 - Employee-student status
 - Credit by examination
- For admitted and non-admitted UCD students:
 - University Extension courses
 - Summer Sessions courses

- For students who have not been admitted to UCD:
 - Concurrent courses

Preadmission advising is available to nontraditional students through the Academic Reentry Program.

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 College Board test 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 the Academic Information section in this catalog for a full description of the means by which this requirement may be satisfied.

Advanced Placement Examinations

The Advanced Placement Examinations of the College Board are taken in conjunction with courses taken in high school. You can receive 8 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 examination advanced placement for course work equivalencies and limitations of credit.

Credit from Another Institution

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 that section in regard 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 the Engineering section.)

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 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 (payment of fees) 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 happen include departmental open houses, tours of the campus, concerts and lectures, registration, enrollment, 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
(916) 752-2973

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

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

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

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

Your registration is complete when you have submitted your registration forms, had your photo taken (first term of enrollment only), 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 this deadline will be allowed only under conditions where action or inaction on the part of the University delays registration. A recommendation from an appropriate administrative unit will be required.

If you have not satisfied the Subject A requirement, you must enroll in English A. 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.

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

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

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

Variable-Unit Courses

Subject to the approval by the department chairperson an instructor may arrange to give a special study course (numbers 92, 97T, 97TC, 98, 99, 192, 194H, 197T, 197TC, 198, 199) to interested students. These courses are graded on a Passed/Not Passed basis *only*. Under special circumstances, an instructor may request from the Academic Senate 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.

Credit in *Special Study Courses* (numbered 99, 194H, 199) is limited to a total of 5 units per term.

Adding or Dropping Courses

You are officially enrolled in all courses listed on your individual study list and will be held responsible for completing each of the courses. You must file an Add-Drop petition in order to add or drop courses after this initial enrollment. Petitions are to be filed with the departments offering courses to be added or dropped.

See the Academic Calendar in the front 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

Academic
Information

I'd recommend the Integrated Studies Program to entering freshmen—it allows you to explore many academic areas before deciding what to get a degree in.

***Senior,
Agricultural
Economics***

which is on your study list and for which you did no gradable work is reflected on your official transcript. A verification of your study list is available some time during the fourth week of each quarter.

Changes of Major, College, or School

With the approval of the appropriate dean or deans, an undergraduate student in good standing can transfer from one area of study to another. Petitions for this purpose may be obtained from the Office of the Registrar (Letters and Science major change petitions are obtained from department offices).

Petitions for a change of college must be filed in the first five weeks of the quarter. Requirements for changing a major in a given college are listed under each college section in this catalog.

Change of Name

Petitions for this purpose may be obtained from the Office of the Registrar. (Students planning to graduate should file this petition no later than the fifth week of the quarter in which they intend to graduate.)

INDEPENDENT STUDY PROGRAM

Information:
752-2231

The Independent Study Program is intended to provide an opportunity for upper-division students to design and pursue a full quarter (12-15 units) of individual study in an area of their special interest.

Under the current system of numbering courses, a program qualifying as Independent Study will consist of one or more courses in the 190-199 series, adding up to a quarter's work. While the theme of such a program may be reasonably broad, a recognizable common thread should unite all the academic work you undertake during an independent study quarter. Regularly offered formal courses will therefore only be acceptable as a part of such a program if they clearly fit its theme and contribute something essential toward the realization of its objectives. The program is definitely not to be considered as merely a way to take more variable-unit courses than normally permitted.

The procedure for enrolling in an Independent Study Program is as follows:

1. develop, in general terms, a plan of study;
2. locate a faculty sponsor or panel of sponsors, and with their help and approval develop a detailed plan;
3. complete a project proposal form (obtained from the Academic Senate Office) and submit it to the Academic Senate Committee on Courses of Instruction.

The deadline for applications is the end of the second week of the term prior to the term in which the project is to be undertaken. (See the Academic Calendar at the front of the catalog for specific dates.)

You must report the completion or termination of the project to the Committee on Courses of Instruction.

For further information contact the chairperson of the Committee on Courses of Instruction, c/o Academic Senate Office, in person or by telephone.

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. (For Public Affairs internship procedures, see under Political Science.) The deadline for 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.



WITHDRAWALS AND LEAVES OF ABSENCE

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. Petitions for Withdrawal Forms are available at the Office of the Registrar. Information on fee refunds can be found in the Fee Refund section of this catalog. (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 undergraduate student planning to return to the University of California at Davis, you must file an Application for Readmission available in the Office of the Registrar, with a nontransferable, non-refundable 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 to the Office of the Registrar.

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

Quarter	Deadline Date
Fall 1988	August 26, 1988
Winter 1989	December 6, 1988
Spring 1989	March 2, 1989
Fall 1989	August 28, 1989

Graduate students applying for readmission should refer to the Graduate Division section in this catalog for filing information.

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. PELP is not to be used for a medical leave. If you cannot attend school because of medical reasons, you should request a Petition for Withdrawal available in the Office of the Registrar. (Also see Readmission after an Absence.)

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.

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

A fee of \$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 leave is one full academic year. You may, however, request an extension of your leave. For purposes of this program, leave of one full quarter is defined as a leave beginning no later than the tenth day of instruction in a quarter. You should be entitled to a partial refund of fees paid. (See Fee Refunds.)

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

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

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

SCHOLASTIC REQUIREMENTS

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

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

If you're a student who wishes to be challenged academically, Davis will do it for you.

*Junior,
International
Relations*

it possible to anticipate the amount of work involved in a particular course, and enable you to transfer from one campus or university to another without undue difficulty. (To convert quarter units to semester units, multiply by 2/3; from semester to quarter units, multiply by 3/2.)

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

In most courses at Davis the standard procedure prevails, so that a three-unit course meets for three hours a week, a four-unit course for four hours, and so on. Courses that are an exception to this pattern may require additional class time or give more demanding assignments. If you have questions about the number of units assigned to a course you should check the "Expanded Course Descriptions" (if your college or department provides them) or ask the instructor what is required in terms 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.

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 Office of the Registrar. The petition is subject to the approval of the instructor giving the examination and the department involved.

The completed petition, accompanied by a fee of \$5, 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 earned toward your degree. The final results will be reported to the Office of the Registrar which will assign you the appropriate grade and grade points. Since failure to pass the examination will be recorded as an F, you are encouraged to prepare fully for such an examination before attempting it.

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

Enrollment at Another Institution

A student may not obtain transfer credit for courses taken at a non-University of California campus in a term during which the student is enrolled as a full-time student at UCD. A variance can be obtained only by petitioning the dean of your college well in advance of the desired 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. Summer session courses are exempt from this regulation.

It is 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 Admissions Office for evaluation. On your transcript UCD Summer Sessions courses are identified by the letter "S" preceding course numbers. (There is no provision for auditing in Summer Sessions.)

See the Summer Sessions bulletin for detailed information.

GRADING

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

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

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

Grade Points

Grade points are assigned each letter grade as follows:

4.0 = A+	2.7 = 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 Scholarship Deficiencies).

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 not counted in determining your grade-point average.

The intent of this option is to encourage exploration in areas in which you have little or no previous experience by alleviating grading pressures. **The maximum number of units graded P that will be accepted for degree credit is 1/3 of the units completed in residence on the Davis campus.** Consequently, at least 2/3 of the units completed in residence at Davis and presented in satisfaction of degree requirements must be in courses taken for a letter grade. 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. Students who plan to attend graduate or professional school should consult with Advising Services regarding Passed/Not Passed grading.

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

A course in which a D or F is 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 earned 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 also Individual Study courses.) A course 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. Such courses count toward the maximum number of units graded P allowable toward the degree. (See also 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. (See above for P/NP grading option.)

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 a course for which an I grade has been assigned. An undergraduate student whose record shows more than 16 units of I grades will be subject to disqualification. A graduate student who accumulates more than eight units of I grades will be subject to probation.

Incomplete grades will not be included in your grade-point average at the end of a quarter. At the time of graduation, however, any remaining I grades are included when your grade-point average is computed, in order to determine whether you have achieved the 2.0 average required for the bachelor's degree. *An Incomplete grade, in these computations, has the same effect as a grade F, NP, or U, depending on 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 by the instructor can be documented, you may request a change of grade with a petition available from department offices.

Although I have only attended Davis for a short time, I have learned much about myself and others. I have grown intellectually and I'm confident that this will continue throughout my career here.

*Freshman,
Agriculture
Economics*

Repetition of Courses

An *undergraduate student* may repeat only those courses taken on a UC campus in which grades of D, F, or NP have 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 grades 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 ask the instructor. Those who have deficient grades (D, F, or Not Passed) are urged to confer with their advisers.

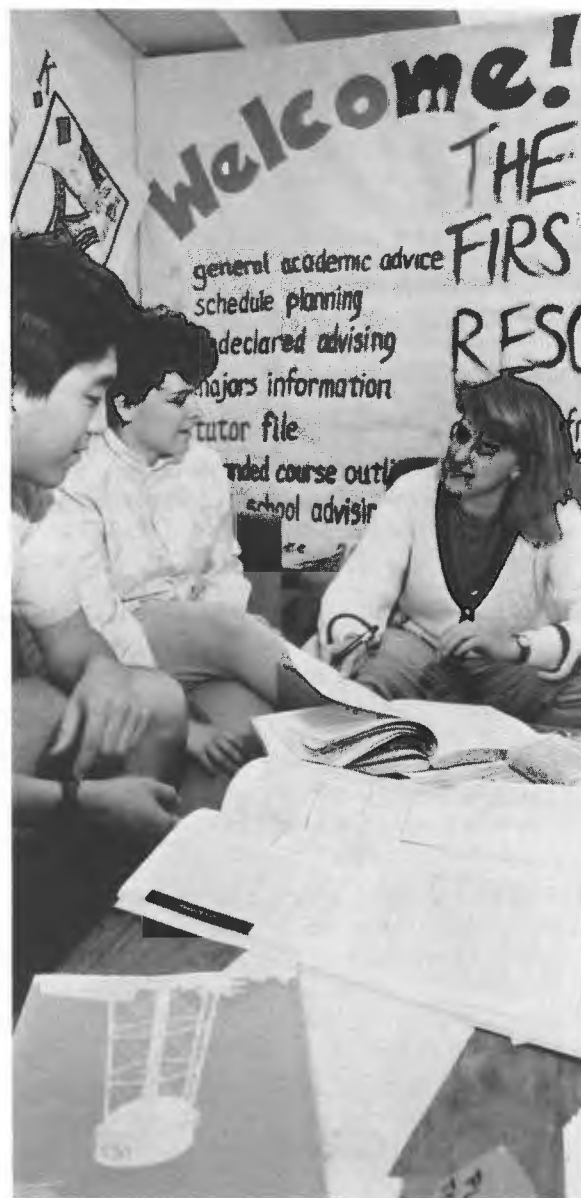
Final Grades

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

Transcripts

A record of each student's academic work at UCD is prepared and retained permanently by the Office of the Registrar. Copies of your official transcript may be obtained from that office for \$3 a copy. 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 – 40.0
Sophomore	40.1 – 83.9
Junior	84.0 – 134.9
Senior	135.0 –

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 en-



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

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

Learning Disability specialist, whether an adjustment is necessary and specifies the terms of the adjustment.

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

An instructor may release each student's original examination, or a copy, at any time. Otherwise the instructor will 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.



College Board Advanced Placement (AP) Examination Credit

If you take one or more of the CEEB Advanced Placement (AP) Examinations and score 3, 4, or 5, you will be awarded college credit. The credit will become part of the minimum 180 quarter units you need in order to receive a bachelor's degree. The credit from the AP Examinations may also be used to satisfy specific degree requirements. Consult the chart on this page to learn how many units you will receive for an AP Examination (see the column headed: Credit Toward Degree), and how those units will be applied toward specific degree requirements (see the column headed: Credit Allowed Toward Specific Degree Requirements).

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

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	5, 4	English A, 1, 3		8 units	English/Humanities Credit Satisfies Subject A requirement. College of Agricultural and Environmental Sciences: 4 units Four units satisfies first part of English composition requirement. College of Engineering: 8 units Satisfies English 1, 4 units toward Humanities and Social Sciences electives, and 2 units toward Unrestricted electives. College of Letters and Science: 4 units Humanities and Fine Arts credit. Satisfies first course toward English Composition requirement.
	3	English A		8 units	Satisfies Subject A requirement.
FOREIGN LANGUAGES					
French	5	French 6	French 30A, or consultation with adviser.	8 units	Humanities Credit/Unrestricted Electives 4 units. For each foreign language examination passed.
	4	French 4	French 6.	8 units	In the College of Agricultural and Environmental Sciences, satisfies credit toward Humanities/Unrestricted electives.
	3	French 3	French 4.	8 units	In the College of Letters and Science, examinations also satisfy the Foreign Language requirement.
German	5, 4	German 4, 6A, or 6B	German 101, upper division literature courses.	8 units	In the College of Engineering, satisfies units toward Unrestricted electives.
	3	German 3	German 4, 100A, 100B, or 100C.	8 units	
Latin (Vergil)	5, 4, 3	Latin 2	Determined by consultation with Classics adviser.	4 units	
(Lyric)	5, 4, 3	Latin 2	Determined by consultation with Classics adviser.	4 units	
Spanish	5, 4	Spanish 5, 4	Spanish 6 and 28, or more advanced course.	8 units	
	3	Spanish 4	Spanish 5, or consultation with adviser.	8 units	
HUMANITIES					
Art Studio	5	Art 2, 5	Art 3.	8 units	Humanities Credit/Unrestricted Electives 8 units
	4	Art 2	Art 3 or 4.	8 units	4 units
Art History	5, 4	Art 1A, 1B, 1C		8 units	8 units
	3	Art 10H		8 units	4 units
American History	5, 4, 3	History 17A, 17B		8 units	8 units
European History	5, 4, 3	History 4B, 4C		8 units	8 units
Music	5, 4, 3	Music 10		8 units	4 units
NATURAL SCIENCES					
Biology	5, 4	Biological Sciences 1 and Botany 2 or Zoology 2-2L	Botany 2, Microbiology 2 and 3, Zoology 2-2L, or any appropriate upper-division course in the biological sciences.	8 units	Natural Sciences Credit/Preparatory Courses for Science Majors 8 units Student has option of taking Botany 2 or Zoology 2-2L for full credit. In the College of Engineering, satisfies 4 units toward Technical electives.
	3	Biological Sciences 1	Botany 2, Microbiology 2 and 3, or Zoology 2-2L.	8 units	4 units
Chemistry	5, 4, 3	Chemistry 1A, 1B		8 units	8 units Credit for Chemistry 1A and 1B equivalence may serve as prerequisite to 1C with consent of instructor. While 1A and/or 1B may be taken for full credit, the 4A-4B-4C sequence is preferred. Credit for Computer Science Engineering 30 may serve as prerequisite for Computer Science Engineering 40 with consent of instructor.
Computer Science	5, 4	Computer Science Engineering 30	Computer Science Engineering 40.	4 units	4 units
	3			4 units	In the College of Engineering, satisfies units toward Unrestricted electives.
Mathematics AB	5	Mathematics 11, 16A, or 21A	Mathematics 16B or 21B.	4 units	4 units Mathematics 16A or 21A may be taken for full credit. Credit for Mathematics 16A or 21A equivalents may serve as prerequisite for Mathematics 16B or 21B.
Mathematics BC	4, 3			4 units	—
	5	Mathematics 11, 16A-16B, 21A-21B	Mathematics 16C or 21C.	8 units	8 units Mathematics 16A or 21A may be taken for full credit.
Physics B	4, 3			8 units	—
	5	Physics 1A, 1B, 6A, 6B, 6C, 10	Determined by consultation with adviser.	8 units	8 units No credit for laboratory parts of Physics 6 or 8.
B	4, 3	Physics 10		8 units	4 units Course equivalents may be used as prerequisites for succeeding courses of same series with consent of instructor.
CI	5	Physics 1A, 6A or 8A		4 units	4 units
CI	4	Physics 1A or 6A		4 units	4 units In the College of Engineering, only a score of 5 on Physics (CI and CII) Examinations applies toward Physics requirement.
CII	5	Physics 1B, 6B, or 8B		4 units	4 units
CII	4	Physics 1B or 6B		4 units	4 units
SOCIAL SCIENCE					
American Government and Politics	5, 4, 3	Political Science 1		4 units	Social Science Credit Unrestricted Electives 4 units Political Science 1 satisfies American History and Institutions requirement.
Comparative Government and Politics	5, 4, 3	Political Science 2		4 units	4 units In College of Agricultural and Environmental Sciences, satisfies credit toward Social Science requirement or Unrestricted electives. In College of Engineering, satisfies credit toward Humanities-Social Sciences electives. In College of Letters and Science, satisfies credit toward Social Sciences area requirement.

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.

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.

The official transcript will in the case of qualitative standards reflect *in good standing* or *not in good standing*.

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

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

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 the 180-unit minimum degree requirement prior to completing fifteen terms of enrollment. Normal progress would achieve 180 units in 12 terms.

The following courses may be counted toward unit minimum progress:

- Required non-credit courses, e.g., Mathematics B, will be evaluated according to the "Carnegie unit" rule and counted as units passed
- Repeated courses passed to improve D or F grades
- Courses passed during Summer Sessions at UCD or at another accredited school and transferred to UCD will be counted as units passed (applied to 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 dean of the student's 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.

Dismissal

Dismissal for either qualitative or quantitative reasons (defined above) is based on the decision of the dean of the college in which a student is enrolled. Such dismissal is from the University of California system and not simply the college or the Davis campus. Should a former Davis student later wish to be readmitted on the Davis campus, the authority to do so rests with the dean of the college from which the student was dismissed.



Transfer with Scholastic Deficiencies

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

HONORS AND PRIZES

Deans' Honors Lists

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.

Graduation Honors

Honors at graduation may 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 table below and have met additional college requirements:

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 1988 are shown below. These averages will be used through winter 1989.

Percent Determining Cut-Off Point	Grade-Point Average by College		
	Agricultural and Environmental Sciences	Engineering	Letters and Science
2%	3.875	3.880	3.854
3%	3.826	3.849	3.802
4%	3.767	3.815	3.758
6%	3.663	3.682	3.669
8%	3.602	3.617	3.603
12%	3.485	3.515	3.508
16%	3.402	3.430	3.428

Individual grade-points can be compared once the Winter Quarter 1988 grades become available. 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.

Honorary Societies

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

- Alpha Epsilon (Agricultural Engineering)
- Alpha Kappa Delta (Sociology)
- Alpha Omega Alpha (Medicine)
- Alpha Zeta (College of Agriculture)
- Delta Phi Alpha (German)
- Dobro Slovo (Russian)
- Omicron Delta Epsilon (Economics)
- Omicron Nu (Applied Behavioral Sciences)
- Order of the Coif (Law)
- Phi Alpha Theta (History)
- Phi Beta Kappa (Liberal Arts and Science)
- Phi Kappa Phi
- Phi Sigma (Biological Sciences)
- Phi Zeta (Veterinary Medicine)
- Pi Alpha Xi (Environmental Horticulture)
- Pi Delta Phi (French and Italian)
- Pi Mu Epsilon (Mathematics)
- Pi Sigma Alpha (Political Science)
- Prytanean Honor Society
- Psi Chi (Psychology)
- Sigma Pi Sigma (Physics)
- Sigma Xi (Research)
- Tau Beta Pi (Engineering)
- The Golden Key

Bachelor's Degree Requirements



Bachelor's Degree Requirement

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. General Education requirement, which applies to all colleges;
3. College or school requirements; and
4. Major requirements.

Detailed information on University requirements and the General Education requirement can be found on the following pages. (See specific college sections for information on college and major requirements.)

Bachelor's Degree Requirements

University Requirements

All students must fulfill the following University of California requirements:

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

General Education Requirement

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

College Requirements

College of Agricultural and Environmental Sciences

- Unit
- Scholarship
- English Composition
- Breadth (in the major)

College of Engineering

- Unit
- Residence
- Scholarship
- English Composition

College of Letters and Science

- Unit
- Residence
- Scholarship
- English Composition
- Breadth
 - Foreign Language (A.B. and B.A.S. degrees)
 - Area Credit

Major Requirements

Every major has course requirements which are listed in the Programs and Courses section of this catalog.

UNIVERSITY REQUIREMENTS

Subject A: English Requirement

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

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

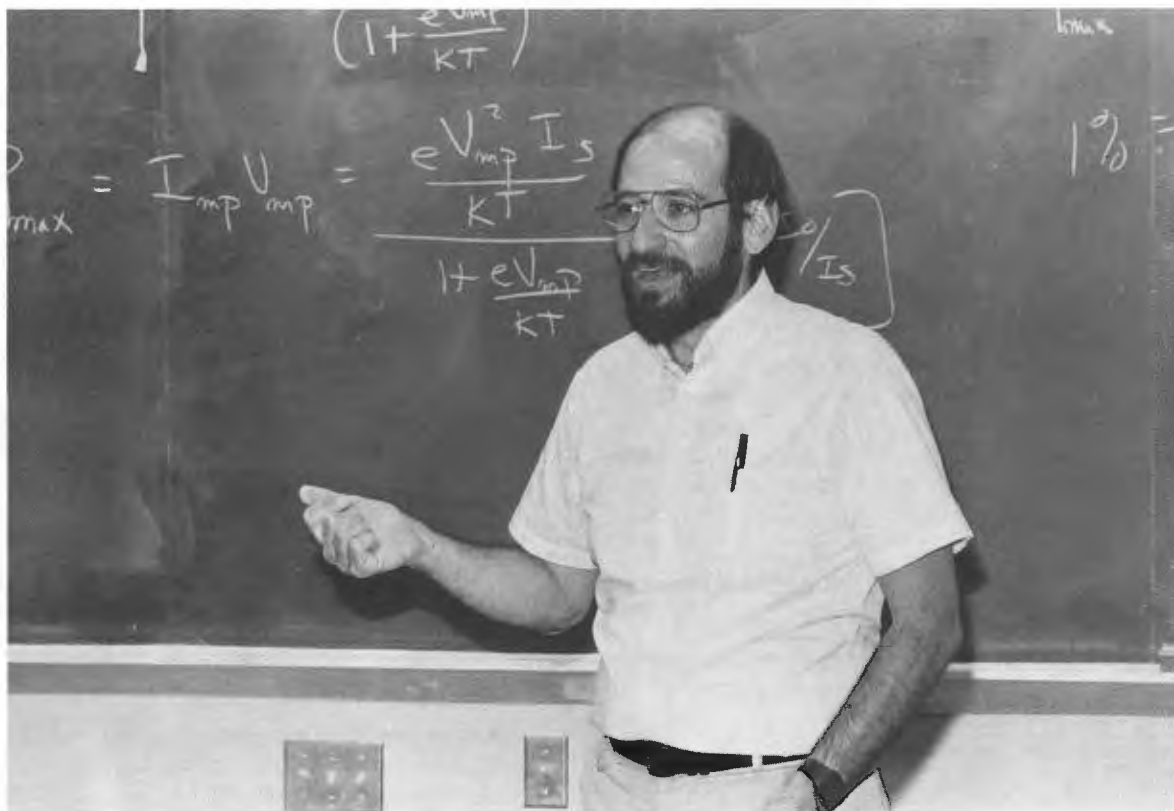
- By achieving a score of 600 or higher on the College Board Achievement Test in English Composition.
- By achieving a grade of 5, 4, or 3 in the College Board Advanced Placement Examination in English.
- By entering the University with credentials showing the completion of an acceptable 3-semester or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

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 2-unit course counts as 4 units on your study load and toward minimum progress.

Students whose native and school language is not English, and some students whose schooling combines work in the United States and in another country, must demonstrate proficiency in English. The level of proficiency must meet the standards of both the non-native speakers of English program and the Subject A program. The results of the Subject A Examination *and* a special examination in English administered during the orientation period each quarter determine whether a student has met the Subject A requirement or must take specific 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, 72A, 72B, 170A, 170B, 170C, 171A, 171B, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 177A, 177B, 179, 180A, 180B, 183A, 183B (upper-division courses may be taken only with the consent of the instructor)
 Native American Studies 10, 55, 116, 130A, 130B, 130C
 Political Science 1, 5, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 130, 131, 160, 163

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

- By presenting evidence that the requirement has been accepted as satisfied at another campus of the University.

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

- By successful completion of the Advanced Placement Examination in American History.

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

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

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 appropriate college or school).

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

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

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

My experiences at UCD have been very positive. Most of my instructors have been caring, considerate and encouraging. I would recommend this institution to anyone who is willing to work hard to accomplish high goals.

*Senior,
Individual
Major*

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.

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.

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

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

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

Scholarship Requirement

To receive a bachelor's degree, you must obtain twice as many grade points as units for all courses you have attempted in the University. An exception to this rule is authorized for those students undertaking certain honors courses. Grades earned in University Extension courses are not used in calculating individual grade-point averages. For specific college and school requirements consult the appropriate sections of this catalog.

Filing for Degree Candidacy

Each candidate for an undergraduate degree must file an Announcement of Candidacy with the Registrar's Office for the quarter in which the candidate plans to receive the degree. The dates for filing are published in the Academic Calendar at the front of this catalog.

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.

General Education (GE) courses are grouped into 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 humankind. 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 students not primarily interested in scientific disciplines be prepared to read and understand scientific literature addressed to the educated public.

Fulfilling the General Education Requirement

Each academic major and degree program has been assigned to one of the above three areas of General Education. Each approved GE course has also been assigned to one of the three areas. The General Education Program requires you to complete a certain number of courses in those areas of General Education **other** than the one which contains your major field.

Because the General Education Program was phased

in over a four-year period, the number and level of GE courses to be completed depends upon two things: (1) the academic year in which you first registered and enrolled as a student at UCD; and (2) the number of approved transfer units, if any, which you may have possessed at the time of your first registration and enrollment at UCD in a regular academic term. If you have any questions concerning the number of units to be used in calculating your General Education requirement, contact your college dean's office.

The specific General Education requirements for students entering UCD from the 1984/85 to 1986/87 academic years are detailed in prior editions of the General Catalog for each academic year. For students entering UCD in 1987/88, 1988/89, or thereafter, the General Education requirements are detailed below:

- If you are a *freshman* or a *transfer student with 40 or fewer transfer units*, you are required to complete the *full requirement* of three GE courses in each of the two areas outside the area of your major. One of the three courses in each area must be an introductory GE course and the other two non-introductory.
- If you are a *transfer student with more than 40, but fewer than 84, transfer units*, you are required to complete one of two options, either: (1) two GE courses in each of the two areas outside your major; or (2) three GE courses in one of the required areas and one course in the other required area. If you choose the first option, only one course in each area may be introductory. If you choose the second option, one of the courses in the group of three courses must be introductory and the other two non-introductory. The single course taken in the other area may be introductory or non-introductory.
- If you are a *transfer student with 84 or more transfer units*, you are required to complete one of two options, either: (1) one GE course in each of the two areas outside the area of your major; or (2) three GE courses in one of the two areas. If you choose the first option, both courses must be non-introductory. If you choose the second option, one course must be introductory and the other two non-introductory.





Effective with the fall quarter, 1986, there are two restrictions that apply to GE courses.

1. *GE courses must be taken for a letter grade.* Any student who wishes to receive General Education credit for a course must take that course for a letter grade. No General Education credit will be awarded for a course that is taken on a passed/not passed basis. Should you take a course approved as a GE course on a passed/not passed basis, you will be unable to apply that course toward the General Education requirement.
2. *Subject A requirement must be completed before you begin your GE coursework.* Except for those approved course sequences of non-GE courses for which General Education credit may be earned (see note 2 in "Table of General Education Courses and Academic Year of Approval" at page 72-73), no student may receive General Education credit for completing a GE course unless that student has first sat-

isfied the University Subject A requirement. Should you complete a GE course prior to completing Subject A, you will be unable to apply that course toward the General Education requirement.

These two restrictions, while applicable to all students who must fulfill a General Education requirement, took effect with the beginning of fall quarter, 1986. If you completed a GE course before fall 1986 on a passed/not passed basis or before having completed Subject A, you will still receive General Education credit for that course.

Selecting General Education Courses

Since GE courses must be chosen from the two areas of General Education **other** than the one containing your major field, you must begin by identifying the area of General Education to which your major has been assigned. The following list provides this information.

Civilization and Culture (CC)

American Studies	Landscape Architecture
Art History	Latin
Art Studio	Linguistics
Chicano (Mexican-American) Studies (Humanities emphasis)	Medieval Studies
Classical Civilization	Music
Comparative Literature	Philosophy
Design	Religious Studies
Dramatic Art	Rhetoric and Communication
East Asian Studies	Russian
English	Spanish
French	
German	
Greek	
History	
Italian	

Contemporary Societies (CS)

Afro-American Studies	Human Development
Agrarian Studies	International Agricultural Development
Agricultural and Managerial Economics	International Relations
Agricultural Education	Native American Studies
Anthropology (A.B. degree)	Political Science
Applied Behavioral Sciences	Political Science—Public Service
Asian American Studies (non-degree program)	Sociology
Chicano (Mexican-American) Studies (Sociology emphasis)	Sociology—Organizational Studies
Economics	Textiles and Clothing
Environmental Planning and Management	Women's Studies
Environmental Policy Analysis and Planning	
Geography (A.B. degree—emphasis I, II, III, V)	

Nature and Environment (NE)

Agricultural Science and Management	Genetics
Animal Science	Geography (B.S. degree; A.B. degree—emphasis IV)
Anthropology (B.S. degree)	Geology
Applied Physics	Mathematics
Atmospheric Science	Microbiology
Avian Sciences	Nutrition Science
Biochemistry	Physical Education
Biological Sciences	Physics
Botany	Physiology
Chemistry	Plant Science
Community Nutrition	Preforestry (non-degree program)
Computer Science	Psychology
Consumer Food Science	Range and Wildlands Science
Dietetics	Resource Sciences
Engineering (all majors)	Soil and Water Science
Entomology	Statistics
Environmental Toxicology	Textile Science
Fermentation Science	Wildlife and Fisheries Biology
Food Biochemistry	Zoology
Food Science	

If you have declared **multiple majors** where *all* of your majors are classified in the *same* Area of General Education, you complete the General Education requirement just as you would if you had a single major; you should select the required number of courses from the two General Education areas other than the one containing your majors. However, if your majors are classified in two or more *different* areas of General Education, you are required to complete only the appropriate number of courses in the one area of General Education, if any, in which you do *not* have a major.

If you have an approved **individual major**, it should have been assigned to one of the three General Education areas at the time it was approved by your college. If you have any questions concerning the General Education area to which your major is assigned, consult your college dean's office.

Approved General Education Courses

Once you determine the General Education area to which your major has been assigned, you should select the required number of GE courses from the two areas *not* containing the major. Following is a table of the approved courses and course sequences which have been selected for offering under the General Education Program.

You should remember that you cannot claim credit toward the General Education requirement for a course that you completed before that course was approved for General Education credit. Because the approval of courses to satisfy the GE requirement is an ongoing activity of the faculty committee which is responsible for the General Education Program, the table also indicates the academic year in which each course was first approved for General Education, e.g., American

Studies 1A (85) was first approved as a GE course for the 1985/86 academic year which began in the fall quarter of 1985 and extended through the summer sessions of 1986.

Introductory and Non-Introductory General Education Courses

As you can see from the following table, GE courses may be either introductory or non-introductory. Introductory GE courses assume no prior knowledge or exposure to the field, whereas non-introductory courses require some background coursework or familiarity with the subject. Thus, in the case of non-introductory GE courses, please consult the course descriptions contained in the Programs and Courses section of this catalog for the recommended GE prerequisite courses.

General Education Literature Prerequisite List

In the case of some non-introductory GE courses, the recommended General Education prerequisite listed in the course description includes "any course from the GE Literature Prerequisite List." For 1988/89, this list consists of the following courses: English 3, Comparative Literature 1, 2, 3, French 25, German 52, and Integrated Studies 2D.

Approved General Education Clusters

General Education "clusters" are groups of closely-related introductory GE courses designed to allow you to build upon your intellectual experience from one course to the next.

Even though you may have to complete some non-introductory GE courses as part of your General Education requirement, you may also earn credit for having satisfied the entire requirement in an area of General Education by completing an approved cluster of introductory courses in that area. In effect, completion of a cluster allows you to substitute introductory for any required non-introductory courses.

Beginning with the 1988/89 academic year, there are two approved clusters and they are found in the area of Civilization and Culture: History 4A, 4B, 4C; and Comparative Literature 1, 2, and 3.

College and Major Requirements

The chart at the beginning of this section outlines College requirements in addition to the University and General Education requirements. Detailed information on college and major requirements can be found in specific college sections which begin immediately after this section. Course requirements are listed under each major program in the Programs and Courses section of the catalog.

Bachelor's Degree Requirement

The financial aid and bio sci advising are excellent here. The people in these two offices are warm, concerned and exceptional.

*Senior,
Biological Sciences*

General Education Courses and Academic Year of Approval

Note: Courses listed here were approved beginning with the fall quarter of the academic year indicated (in parentheses following course numbers) and for all subsequent academic years unless otherwise noted. Consult footnotes to this table for additional information concerning these courses.

Civilization and Culture

Introductory:

American Studies 1B (88)
 Art 1A-1AG¹ (87), 1B-1BG¹ (86), 1C-1CG¹ (86),
 1D-1DG¹ (86), 25-25G¹ (88)
 Classics 4A (85), 17A (85), 17B (85), 17C (85),
 20 (85)
 Comparative Literature 1 (84), 2 (84), 3 (84), 5
 (86), 6 (85), 7 (85), 13 (85)
 English 3 (84), 4 (88)
 French 25 (84)
 German 51-52² (84 only), 52 (86)
 History 3 (86), 4A (85), 4B (84), 4C (84), 9A
 (85), 17A (84), 17B (84)
 Integrated Studies 1D (84 only), 2B (84,86),
 2C (84 only), 2D (84), 3B³ (85), 3C³ (85)
 Music 3A-3B² (84), 10 (84)
 Philosophy 1 (84), 10B (84), 10D⁴ (85), 14
 (86), 22 (86), 23 (86)
 Political Science 4 (84)
 Religious Studies 21 (84), 40 (84)

Non-Introductory:

Art 178C (87)
 Classics 40 (85, 86 only), 41 (85, 86 only),
 140⁵(87), 141 (86), 143⁵ (87)
 Comparative Literature 8 (86), 20 (86), 135
 (87), 141 (85), 153 (86), 157 (87), 159C (88),
 160A (85), 160B (88), 161A (85), 161B (85),
 161C (85 only), 163 (85), 164A (87), 164B
 (86), 166A (87), 166B (85), 168A (88)
 Dramatic Art 156 (86), 157 (86)
 Education 120 (85)
 English 30A (87), 30B (87), 30C⁶ (84, 85, 86
 only), 45⁶ (84), 46A (87), 46B (87), 46C⁶
 (84), 118 (88), 127 (88), 171A (87), 171B
 (87), 182 (87), 184 (87)
 Environmental Studies 108 (85, 86 only)
 French 112 (84), 113 (84), 114 (84)
 Genetics 108 (85, 86 only)
 German 110 (87), 113 (84), 115A (84), 116
 (86), 117A (86)
 History 30 (87), 72A (84), 138 (88), 140 (87),
 147A (85), 147B (85), 147C (85), 169A (86),
 169B (88), 175A (86), 177A (87), 177B (87)
 Landscape Architecture 140 (84)
 Medieval Studies 20A (86), 20B (86), 20C (86),
 120E (88)
 Music 110A⁷ (84), 110B (85), 110C⁷ (84),
 110D⁷ (84), 129 (86)
 Native American Studies 181A (87), 181B (87),
 181C (87)
 Philosophy 18 (87), 101 (88), 102 (88), 105
 (85), 107 (88), 108 (85), 151 (86)
 Religious Studies 18 (87), 141A (86), 141B
 (86), 141C (86)
 Rhetoric and Communication 110 (84)
 Russian 131 (88)
 Spanish 149 (86)

Contemporary Societies

Introductory:

American Studies 1A (85)
 Anthropology 2 (84), 4 (86)
 Economics 1A-1B² (84)
 Geography 2 (84, 85, fall 86 only), 2-2D¹ (winter
 87 through summer 88), 2-2G^{1,8}(88), 5 (84, 85,
 fall 86 only), 5-5D¹ (winter 87 through summer
 88), 5-5G^{1,8} (88)
 History 10 (84)
 Integrated Studies 2A (84 only), 3A³ (85)
 Linguistics 1 (86)
 Native American Studies 10 (88)
 Political Science 1 (84), 2 (84)
 Psychology 15-16² (84)
 Religious Studies 1 (85), 2 (85)
 Sociology 2 (84), 3 (87)

Non-Introductory:

Afro-American Studies 100 (86), 133 (88)
 Agricultural Economics 120 (88), 141 (85)
 American Studies 45 (85), 120 (84), 130 (87),
 140A (85)
 Anthropology 101 (87), 119 (86 only), 124 (86),
 129⁹ (87) 130 (86), 133⁹ (87), 141 (86 only)
 Applied Behavioral Sciences 2 (85), 151 (87), 153
 (87), 154 (85), 178 (86)
 Consumer Economics 141 (84 only)
 Consumer Science 100 (87)
 Economics 106 (87)
 Education 110 (86), 122 (84), 132 (86)
 Engineering: Civil 160 (84)
 Environmental Studies 1 (86), 101 (87), 133⁹ (87),
 141 (86 only), 161 (84), 165 (85), 166 (86)
 Geography 124 (87), 155 (84), 170 (84), 171 (86)
 History 22 (85), 165 (86)
 Human Development 15 (87)
 International Agricultural
 Development 10 (86)
 Linguistics 113 (86)
 Native American Studies 130C (88)
 Philosophy 117 (86)
 Psychology 177 (87)
 Resource Sciences 10-10D¹ (86, 87 only),
 10-10G^{1,11} (88)
 Rhetoric and Communication 115 (86, 87 only),
 152 (88)
 Sociology 25 (84), 119 (87), 157 (87)
 Textiles and Clothing 7 (85, 86 only), 107¹⁰(87)
 Women's Studies 50 (84)

Nature and Environment

Introductory:

Anthropology 1 (86), 23 (88)
 Astronomy 10 (85)
 Bacteriology 10 (84 only)
 Biological Sciences 10 (85)
 Botany 10 (84)
 Chemistry 1A-1B² (84), 10 (84)
 Engineering 20 (84)
 Food Science and Technology 2 (86)
 Genetics 10 (84)
 Geology 1-1D¹ (86, 87 only), 1-1G^{1,11} (88), 3-3D¹
 (86, 87 only), 3-3G^{1,11} (88)
 Integrated Studies 1A (84), 1B (85)
 Nutrition 10-11¹ (85)
 Physics 10 (85)
 Plant Science 10 (88)
 Water Science 10 (88)
 Wildlife and Fisheries Biology 10 (85)

Non-Introductory:

Agrarian Studies 2 (85)
 Animal Science 1(87)
 Anthropology 15 (86), 152 (86), 153 (88)
 Atmospheric Science 10 (87)
 Avian Sciences 13 (85)
 Bacteriology 20 (85, 86, 87 only)
 Botany 101 (86)
 Engineering: Applied Science 137 (85)
 Engineering: Civil 30¹² (85)
 Entomology 11 (85)
 Environmental Studies 30 (85), 108 (85, 86 only),
 116-116D¹ (86, 87 only), 116-116G^{1,11} (88)
 Genetics 108 (85, 86 only)
 Geology 113 (84), 116-116D¹ (86, 87 only), 116-
 116G^{1,11} (88)
 Microbiology 20 (88)
 Philosophy 108 (85)
 Physics 137 (85)
 Resource Sciences 2 (86), 3-3L¹ (88), 131 (86)
 Textiles and Clothing 110 (86)

¹These GE courses must be taken concurrently for General Education credit and will satisfy the requirement for one GE course.

²This is a two-course sequence of non-GE courses which will satisfy the requirement for one GE course.

³Integrated studies 3A, 3B, and 3C were first approved for General Education credit for 1984-85 as Integrated Studies 2A, 2B, and 2C, respectively; they were renumbered effective fall, 1985. A new course 2B was created and approved for GE effective fall, 1986.

⁴Philosophy 10D was classified as a non-introductory GE course in the area of Contemporary Societies for 1985-86 and 1986-87; it was reclassified as an introductory course in Civilization and Culture effective fall, 1987.

⁵Classics 140 and 143 were first approved for General Education credit as Classics 40 and 41, respectively; they were renumbered effective fall, 1987.

⁶English 30C, 45, and 46C were approved as Introductory GE courses in 1984-85 and 1985-86; they were reclassified as non-introductory courses effective fall, 1986.

⁷Music 110A, 110C, and 110D were approved as introductory General Education courses for 1984-85; they were reclassified as nonintroductory courses effective fall, 1985.

⁸Geography 2 and 5 were first approved for General Education credit for 1984-1985; they were approved to be taken concurrently with courses 2D and 5D, respectively, effective winter, 1987; these were renumbered 2G and 5G respectively, effective fall 1988.

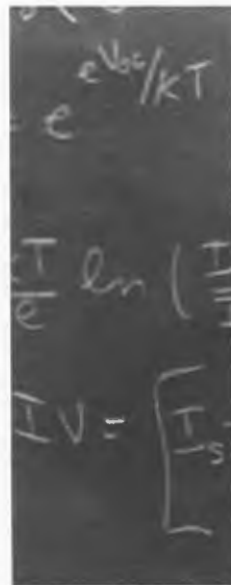
⁹These courses were first approved for General Education credit for 1986-87 and were renumbered effective fall, 1987: Anthropology 119 and Anthropology 141/ Environmental Studies 141 were changed to Anthropology 129 and Anthropology 133/ Environmental Studies 133, respectively.

¹⁰Textiles and Clothing 107 was first approved for General Education credit as course 7; it was renumbered effective spring, 1988.

¹¹These courses were first approved for General Education credit for 1986-87 and were renumbered effective fall, 1988: Environmental Studies 116D, Geology 1D, 3D, and 116D, and Resource Sciences 10D changed to Environmental Studies 116G, Geology 1G, 3G, and 116G, and Resource Sciences 10G, respectively.

¹²Civil Engineering 30 was approved as an introductory GE course for 1985-86; it was reclassified as a non-introductory course effective fall, 1987.

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 human'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 thirty-eight 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, food processing, 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 their needs to learn, and utilize their knowledge. Furthermore, the College's programs focus 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 Dean's Office, 228 Mrak Hall.

Student representatives are elected from each major in the Spring Quarter to serve on the Dean's Student Advisory Committee (DSAC). The DSAC meets with the Dean monthly throughout the academic year to discuss issues of concern to students and the College. Sub-

committees are established to study special topics and to develop student recommendations on major policy issues affecting the college and/or campus.

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 Dean's 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 in Program Planning. 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 associate dean, faculty members, advising staff, 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 the college's programs can be flexible to serve a student's needs. 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. In designing a major program individual students should consult their adviser and the Catalog to find the most suitable courses. Prerequisites to selected courses need to be planned in advance.

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 knowledge by other

College of
Agricultural and
Environmental
Sciences

***I'm
enjoying
my time
here as a
student.
People are
friendly
and helpful
in every
way.***

*Graduate
student,
Agriculture*

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 prerequisite courses. Courses may also be challenged by examination.

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 ADVISING SERVICES

University life is a complicated, sometimes bewildering experience. The College offers a variety of ways that you can obtain advice or help in solving your problems. Some of these services are described in the sections following.

Office of the Dean

The Dean's Office is open to students for a variety of services. The professional staff can assist you with many of your academic advising and extra-curricular activities. Its primary functions are

- General academic advising: advice regarding probation/dismissal questions, admission to College, readmission, and second bachelor's, limited, and regular status.
- Action on petitions that require the Dean's approval (e.g., change of major, change of I grade, change of status, waiver of minimal progress, late Add/Drop petitions, PELP petitions, Withdrawal petitions.)
- Additional services include: Study Plan clearance; College English requirement check; release of holds on registration packets; evaluation of each student's record for graduation purposes; and a unit devoted to special events in the College, which is responsible for the College commencement program.

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 options available, 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 who are 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 and Student Affairs

Associate Deans:
Ericka L. Barrett
Shu Geng
228 Mrak Hall
752-0107

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

Orientation Class

Each quarter the College offers an Orientation course (see Programs and Courses section) 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 *General 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, basis for grading, course format,

special assignments (papers, field trips, etc.), and a topical outline of the material to be covered.

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

Internship Courses

Students who wish to secure credit for an internship must arrange for enrollment in a 92 or 192 course through the appropriate department and Work-Learn and Career Planning and Placement Office. (See the College Requirements for unit limitations.)

MAJOR 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

Subject Areas and Majors

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 advising centers or the Dean's Office. 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 Davis Campus requirement in the Academic Information section): Contemporary Societies (CS), Nature and Environment (NE), and Civilization and Culture (CC). The appropriate category is indicated immediately following the major.

ANIMAL SCIENCE

Majors in Animal Science

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

Advising Centers:

1149 Food and Agricultural Sciences Building, 752-6118 (Animal Science only)
3202 Food and Agricultural Sciences Building, 752-1300 (Avian Sciences only)
66 Briggs Hall, 752-6586 (Wildlife and Fisheries Biology only)

Interdisciplinary Major

Agricultural Science and Management (NE)

Advising Center:

1149 Food and Agricultural Sciences Building, 752-6118

APPLIED ECONOMIC AND BEHAVIORAL SCIENCES

Majors in Applied Economics

Agricultural and Managerial Economics (CS)

Advising Center:

University House Annex, 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)

Majors in Biological Sciences

Biochemistry (NE)
Biological Sciences (NE)
Botany (NE)
Genetics (NE)
Microbiology (NE)
Physiology (NE)
Zoology (NE)

Advising Centers:

376 Mrak Hall, 752-0410 (Biological Science only)
196 Briggs Hall, 752-0204 (Animal Physiology only)
151 Robbins Hall, 752-0617 (Botany only)
2320 Storer Hall, 752-7468 (Zoology only)

FOOD, NUTRITION, TEXTILE AND CONSUMER SCIENCES

Majors in Food Sciences

Consumer Food Science (NE)
Fermentation Science (NE)
Food Biochemistry (NE)
Food Science (NE)

Advising Centers:

128 Cruess Hall, 752-1468 (Consumer Food Science, and Food Science only)
3469 Chemistry Annex, 752-2159 (Food Biochemistry only)
3001 Wickson Hall, 752-1909 (Fermentation Science only)

Majors in Nutrition

Community Nutrition (NE)
Dietetics (NE)
Nutrition Science (NE)

Advising Center:

1151 Food and Agricultural Sciences Building, 752-2512

Majors in Consumer Sciences

Textiles and Clothing (CS)
Textile Science (NE)

Advising Center:

129 Everson Hall, 752-4417

***I got a job
in my field
right out of
school
because I
took
advantage
of
internships.
Places
which offer
internships
such as the
Student
Farm give
students a
chance to
explore
areas not
otherwise
open to
them.***

*Graduate
student,
Animal Science*

PLANT SCIENCES AND PEST MANAGEMENT

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
273 Hoagland Hall (Preforestry only), 752-1511/1406

Major in Pest Management

Entomology (NE)

Advising Center:
380B Briggs Hall, 752-7650

Interdisciplinary Major

Agrarian Studies (CS)

Advising Center:
2039 Wickson Hall, 752-0926

RESOURCE SCIENCES AND ENGINEERING

Majors in Environmental Studies

Environmental Planning and Management (CS)
Environmental Policy Analysis and Planning (CS)

Advising Center:
2134 Wickson Hall, 752-3088

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
4138C Food and Agricultural Sciences Building, 752-1042
(Environmental Toxicology only)

Major in Agricultural Engineering

(See College of Engineering)

Interdisciplinary Major

International Agricultural Development (CS)

Advising Center:
101 Academic Office Building-4, 752-2244

SPECIAL PROGRAMS

Exploratory Program (non-degree program)

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

Are you unsure what major you really want to pursue? If so, you may wish to register in the Exploratory Program. With the assistance 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 you complete 120 units (see Declaration of Major).

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

Individually Designed Major Programs

College Academic Advising Center
122 Hoagland Hall, 752-0610

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.

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 Professional School Preparation section in this catalog.)

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; Pre-Business School Advising Office, 359 Kerr Hall and Work-Learn and Career Planning and Placement Office; or the Pre-Law Advising Office, South Hall.

Teaching Credentials

Inquiries concerning preparation for teaching credentials in Agricultural Education and Agricultural and Home Economics Education should be addressed to the Department of Applied Behavioral Sciences, University of California, Davis 95616.

For general information on obtaining the teaching credential, see Teacher Credential Programs in the Graduate Division section.

Student Experimental Farm

A student farm is available to obtain hands-on experience in crop production and to participate in the sustainable agriculture program. For more information telephone 752-7645.

MINOR PROGRAMS

Departments in the College of Agricultural and Environmental Sciences 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 or major offering the minor (in parentheses).

- 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 Policy Analysis and Planning)
- Entomology (Entomology)
- Environmental Policy Analysis (Environmental Policy Analysis and Planning)
- Environmental Toxicology (Environmental Toxicology)
- Food Service Management (Nutrition)
- Human Development (Human Development)
- Insect Ecology (Entomology)
- Insect Systematics (Entomology)
- International Agricultural Development (International Agricultural Development)
- Medical-Veterinary Entomology (Entomology)
- Native American Studies (Applied Behavioral Sciences)
- Nematology (Entomology)
- Nutrition and Food (Nutrition)
- Nutrition Science (Nutrition)
- Recreation (Environmental Planning and Management)
- Textiles and Clothing (Textiles and Clothing)

A minor normally consists of a minimum of 18 units of upper division course work. Only 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 major and minor 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 minor adviser certify the minor and have your major adviser sign the form, and return the completed form to the Dean's Office. The filing period coincides with that for filing for degree certification (see Academic Calendar in the front of this catalog).

DEGREE REQUIREMENTS

It is your responsibility to see that all requirements for graduation are fulfilled. The University and General Education requirements can be found in the Bachelor's Degree Requirements section of the catalog. You must fulfill the Bachelor of Science requirements in a major as prescribed by, or individually designed and approved by, the faculty.

In brief, the College requirements are as follows, including any restrictions in addition to the aforementioned requirements.

Unit Requirements: Of the required 180 units counted toward a degree, 54 UNITS MUST BE UPPER DIVISION WORK. In addition, the following unit limitations apply to all majors:

- Not more than 6 units can be Physical Education 1
- 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
- Not more than 9 units of professional courses (numbers 300-499) may be used toward the 54 upper division units

Scholarship Requirement: As of Fall Quarter 1984, students in the College are required to attain a minimum grade-point average of 2.000 for all courses specified as depth subject matter 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.

- **English Composition Requirement:** Before you have completed 120 units, you are required to take two courses: either two courses emphasizing written expression or one course emphasizing written expression and one course emphasizing oral expression. The following UCD courses have been approved for satisfaction of this College requirement:

1. One course must be selected from English 1, 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 and Communication 1 (courses emphasizing either writing or speaking skills).

Breadth Requirements (in the major): Each major requires a certain number of units of breadth—Natural Sciences, Social Sciences, and Humanities. These units are specified by the major program. The broadening effect of any particular course is dependent on your major and general interests. (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.

General Education: A General Education course may simultaneously satisfy the campuswide General Education requirement, preparatory subject matter, a breadth requirement or an unrestricted elective required by your major. You should consult your faculty adviser in advance to determine exactly how your General Education courses will apply toward your major.

Degree Requirement Changes: On occasion, the faculty make changes in the requirements that students must satisfy to obtain the baccalaureate degree. So that you will not be penalized by changes that may work to your disadvantage and so that you will benefit by changes that assist you in completing your degree

requirements, it is College policy that you may choose to fulfill the University, College, and major requirements in effect at the time you were enrolled at UC Davis. If you have transferred to UCD from another postsecondary institution of higher education (i.e., community college, college, or university), you may follow the requirements as stated in any UCD Catalog in effect *either* during the three years immediately preceding your transfer to Davis or at the time you first enrolled at that institution, *whichever is most recent*. Once you have chosen the year of the *General Catalog* under which you wish to be governed, you must satisfy all of the University, College, and major requirements specified in that catalog.

Filing for Graduation: You must file a Candidacy Card with the Registrar's Office during the specified filing periods (see Academic Calendar). You must also see your faculty adviser and complete your **Major Certification** (see appropriate college section). 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 Plan Approval

A Study Plan provides for attainment of specific long-term goals and should allow for (a) the acquisition of prerequisite knowledge for courses to be taken in subsequent quarters, (b) the fulfillment of College and major requirements, (c) a proper balance between the demands of the courses and your ability to master the subject matter, and (d) meeting the minimum progress regulation (see the Academic Information section).



In conjunction with a faculty adviser, you must plan and prepare a program that specifies your goals and shows how the graduation requirements will be met. It is a regulation that a written "study plan" be filed with the student's individual adviser by the end of the second quarter of the junior year (having completed not more than 120 units either in residence and/or by transfer). 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.

Major Degree Certification

A Major Certification is completed during the quarter a student plans to graduate. At that time, the adviser and student check to see that all *major* requirements have been completed. The Dean's Office completes the degree certification by verifying that all *College* and *University* requirements have been satisfied.

Declaration of Major/Change 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 prepare at the same time a study plan with your adviser. You are accepted into a major only after both your adviser and the Dean have approved the Change of Major petition.

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 in the College, requests for multiple majors are not normally approved. If you are interested in two or more areas of study, you should consider the options of planning an individually designed



major, or of adopting one or more of the minor programs offered by the College to complement your major. 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.

Passed/Not Passed Option

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

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 Dean's Office or the Advising Center responsible for your intended major or plan a visit to the campus to discuss your program with a faculty adviser. Simultaneous enrollment at another institution requires prior approval by the Dean of the College.

Withdrawal

A student may be permitted to withdraw from the College for emergency reasons or for good cause. Consultation with the Dean is required prior to obtaining the Dean's permission to withdraw. Also refer to the University policy and procedures for withdrawal.

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 encourages you to meet your educational objectives in the most efficient manner commensurate with your educational goals.

HONORS

Dean's Honors List

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 letter-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. Recipients will have this distinction noted on their records and diplomas. Honors at graduation will be awarded according to the conditions specified in the Academic Information section of this catalog.

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 Scholarships.)



College of Engineering



Engineering is the profession in which the physical, biological, and social sciences are applied in a practical way for the benefit of humankind. 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.

Sixteen 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 similar for all engineering curricula. 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 in the Programs and Courses section of this catalog.

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, refer to Graduate Study in Engineering at the end of this section.

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.: Aeronautical Science and Engineering, Agricultural Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, and Mechanical Engineering.

ADMISSION TO THE COLLEGE OF ENGINEERING

Admission to Freshman Standing

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

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

These subjects are prerequisite to certain basic courses in the freshman engineering program. You will be required to make up equivalent work if you are admitted without this preparation. As a result, graduation could be delayed. A year of high school mechanical drawing is also recommended, but not required. 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 shown in the Academic Information section of this catalog. 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. Once you have completed 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 Admission section of this catalog.)

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

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 that are equivalent to English 1, and Rhetoric and Communication 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; Agricultural Engineering—Food Engineering option majors should take courses in Microbiology and Biology.)	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 215.

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. Refer to the section on Academic Information 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 the College of 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. To facilitate student/adviser dialogue on the student's program of study, Advising Worksheets will be provided (extra copies are available in the Engineering Undergraduate Office). The lower division worksheet should be worked out early in the freshman year, signed by your adviser, and then reviewed regularly with your adviser. Similarly, the upper division worksheet should be worked out early in the junior year, signed by your adviser, and then reviewed regularly with your adviser. New freshmen are required to meet with their adviser 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 (Aquacultural and Fisheries Engineering option)
- Agricultural Engineering (Food Engineering option)
- Agricultural Engineering (Forest Engineering option)
- Chemical Engineering
- Civil Engineering
- Computer Science and Engineering
- Electrical Engineering
- 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

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.

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.

MINORS

The College of Engineering does not offer minors in engineering fields; however, engineering students may choose to complete no more than one minor offered by either the College of Agricultural and Environmental Sciences or the College of Letters and Science. (See the minor program list in the specific college section.) A minor normally consists of at least 18 units of upper division coursework.

Planning of a minor program is done through the appropriate major adviser(s) within the college of the minor of choice. Minor request forms are available in the appropriate college dean's office. The filing period coincides with that for filing for degree certification (see Calendar).

Minors are not required and will not be the basis for petitions to substitute classes for approved Humanities-Social Sciences (HSS) electives.

CHANGE OF MAJOR

Because the College is enrolled to capacity, certain restrictions have been established for change of major to or within the College of Engineering. Information concerning the current requirements is available in the Undergraduate Office, 2132 Bainer Hall.

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 Science 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. The advising worksheet described in Academic Advising above is especially helpful.

Specific degree requirements for the various engineering curricula are listed under Engineering in the Programs and Courses section.



The minimum number of required units ranges from 180 to 215, 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.

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 Agricultural Engineering, the Agricultural Engineering options, and 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 and Communication 1 or 3, or humanities-social sciences and general education 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

Variable-Unit Courses: Refer to the Academic Information section of this catalog for unit limitations on special study, internship, and other variable-unit courses.

Internship Courses: Internship courses numbered 92 and 192 are designed to provide practical and applied experience. 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.

University requirements and the General Education requirement for the bachelor's degree are explained in the Bachelor's Degree Requirements section of this catalog.

For the General Education requirement, all majors in the College of Engineering are in the Nature and Environment area. Therefore, courses used to satisfy general education electives must be chosen from the remaining two areas, Civilization and Culture, and Contemporary Societies. The relationship of these courses to the humanities-social sciences electives is discussed under Electives in this section.

Unit Requirements

Each candidate for the degree of Bachelor of Science in Engineering must satisfactorily complete an approved curriculum in engineering. Each curriculum consists of a specified Lower Division Program (or an approved equivalent program for students who transfer into the College with 84 or more quarter units), and a specified Upper Division Program. Detailed requirements for the approved curricula are given in the Programs and Courses section.

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 six professors and six (non-voting) students. A negative decision by the Committee may be appealed to the College faculty for action at a regular meeting.

Residence Requirement

In addition to the University residence requirement, you must complete at least 35 of the final 45 units characteristic of your curriculum in engineering while registered in the College.

Scholarship Requirement

In addition to the University requirement, students are required to maintain a 2.0 grade-point average in all upper division courses both in your major department and in Engineering.

English Composition Requirement

Subsequent to completion of 84 quarter units of college work, the English Composition requirement must be satisfied. The requirement may be fulfilled in one of three 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. Units of credit are not given for passing this examination.)
2. by completing English 103A with a grade of C- or higher.
3. by successfully completing English 102 adjunct to Chemical Engineering 155A or 155B (*for Chemical Engineering and Chemical Engineering/Materials Science and Engineering majors only*).

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 1988/89 academic year, the English Composition Examination will be offered on the following three Saturdays: October 29, January 28, and April 29. Sign-up rosters will be posted on the College of Letters and Science's 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.

Engineering Design in Required Courses

Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process (often iterative), in which the basic sciences, mathematics, and engineering sciences are applied to convert resources optimally to meet a stated objective. Among the fundamental elements of the design process are the establishment of objectives and criteria, synthesis, analysis, construction, testing and evaluation. Each curriculum in the College provides at least 24 quarter units of such design coursework. This occurs through material covered in a combination of required and restricted elective courses. Specific comments about design are given in individual curricula descriptions. *Students should also review the design content of their individual program with their adviser in the course of completing the upper division advising worksheet.*

Electives

There are three kinds of elective courses in the engineering curricula: *humanities-social sciences/general education, technical, and unrestricted.*

Humanities-Social Sciences/General Education 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. Any non-literature course in a foreign language which is not the student's native language can count as a humanities course if the student submits a special petition.

The requirement of 24 quarter units of humanities and social sciences is a College of Engineering requirement and not to be confused with the campus General Education requirement. Students may satisfy the HSS and General Education requirements simultaneously, provided the courses taken are listed on both the list of humanities-social sciences courses which follows (thus meeting the College requirement) and on the list of General Education courses listed in the Bachelor's Degree Requirements section of this catalog.

Students may petition for HSS credit for 92, 98, 99, 192, 197, 198, and 199 courses in appropriate cases. If you repeat any of the courses which may be repeated for credit, not more than 4 units in any such courses can be counted toward your HSS requirement.

- Afro-American Studies 10, 15, 80, 100, 101, 107, 110, 120, 121, 123, 133, 145A, 145B, 150A, 150B
- Agricultural Economics 1, 18, 100A, 100B, 112, 120, 150, 169
- American Studies 1A, 1B, 1E, 1F, 2, 10, 45, 101A-H, 111, 120, 125, 130, 140A, 140B
- Anthropology 2, 4, 101, 112, 114, 120 through 149, 172 through 176
- Applied Behavioral Sciences 1, 2, 17, 18, 151 through 154, 157, 162 through 165, 170, 171, 172, 175 through 178, 191
- Art 1A, 1B, 1C, 1D, 10H, 10S, 15, 20, 25, 150 through 188C
- Asian American Studies 1, 2, 100, 101, 110, 111, 112, 130, 150, 155
- Chicano Studies 10, 20, 101, 102
- Chinese 101, 102, 103, 111, 112, 113, 120
- Classics 4A, 10, 17A, 17B, 17C, 20, 140, 141, 142, 143, 174, 175
- Comparative Literature 1 through 53B, 135 through 169
- Consumer Science 100
- Design 140, 142A, 142B, 143, 144

**I will
always be
proud of
being a
UCD
graduate.**

**Graduate
student,
Ag Engineering**

Dramatic Art 15 (but not 15L), 20, 115, 150 through 159
 East Asian Studies 1, 113
 Economics 1A-1B, 100, 101, 105, 110A through 175
 Education 110, 117, 118, 120, 122, 123, 130, 132, 142, 145, 151
 English 3, 30A, 30B, 45, 46A, 46B, 46C, 110A through 189
 Environmental Studies 161, 164, 165, 167, 169
 Food Science and Technology 20
 French 25, 45, 101, 102, 103, 107, 112 through 123, 140 through 150, 162
 Geography 2, 5, 6, 10, 50, 104, 121, 122A through 127, 141 through 161, 170 through 173, 175
 German 48, 50, 52, 106, 110 through 133
 History 1 through 90A, 101 through 191B, 193 through 196B
 Human Development 15, 100A, 110, 130, 131, 132, 151
 Integrated Studies 2A, 2B, 2D, 2E, 3A, 3B, 3C, 3E, 8B, 8C
 International Agricultural Development 10
 Italian 25, 107 through 139C
 Landscape Architecture 140
 Linguistics 1, 102, 106, 112, 113, 114
 Medieval Studies 20A, 20B, 20C, 120A-F
 Music 3A, 3B, 10, 24A, 24B, 24C, 25A, 25B, 25C, 28, 110A, 110B, 110C, 110D, 113A, 113B, 121, 122, 129
 Native American Studies 1, 10, 32, 33, 55, 70, 101 through 161, 180, 181A, 181B, 181C
 Nutrition 20
 Philosophy 1, 10A-G, 14, 21, 22, 23, 100 through 105, 109, 114A through 123, 143 through 176
 Physical Education 36A, 36B
 Political Science 1 through 7, 100 through 113, 115 through 190
 Psychology 1, 16, 112, 114, 115, 120, 130, 131, 132, 135, 136 through 150, 168, 171, 177, 183
 Religious Studies 1, 2, 4 through 75, 100 through 172
 Rhetoric and Communication 10, 103 through 143, 152
 Russian 30, 41, 42, 120 through 154
 Sociology 1, 2, 3, 25, 102, 110 through 176, 180A, 180B, 181, 182, 185
 Spanish 34, 35, 100, 103A through 109, 111 through 129, 134, 135, 136, 138, 149, 150, 151
 Textiles and Clothing 107
 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.

With the exception of the following courses, all upper division courses in engineering, physics, chemistry, mathematics, and statistics, are suitable as technical electives. The exceptions are as follows:

Engineering Applied Science 137 (restricted to one unit of technical elective)
 Physics 137 (restricted to one unit of technical elective), 194H, 195, 197T, 198, 199
 Chemistry 194H, 197, 198, 199
 Mathematics 192, 197TC, 198, 199
 Statistics 102

In addition, the following courses may be used as technical electives:

Agricultural Economics 113, 140, 147, 148, 157, 176
 Agricultural Engineering Technology 161A, 161B
 Animal Science 1, 105, 133, 160
 Art 121A
 Atmospheric Science 105, 121A, 121B, 124, 133, 149A
 Biochemistry and Biophysics 101A, 101B
 Biological Sciences 1
 Chemistry 1C, 4C, 5, 8A, 8B
 Economics 11A, 11B
 Engineering: Computer Science 168
 English 104
 Environmental Planning and Management 110
 Environmental Studies 100, 116, 128, 128L, 150A, 150B, 150C, 151, 160, 167, 168A, 168B, 169, 173, 178, 179
 Environmental Toxicology 131
 Food Science and Technology 100A, 100B, 102, 104, 108, 111, 131, 150

College of
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Genetics 100

Geography 106, 110

Geology 1, 1L, 17, 50, 50L, 60, 105, 116, 117A, 117B,
123, 124, 134, 150A, 175

Microbiology 2, 102, 130A

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.

Degree Requirement Changes

As engineering is a rapidly developing profession, curricular changes are made by the faculty from year to year. In order to ensure that current graduates benefit from these changes, the College of Engineering has established the following policy: Students graduating during 1987/88 or thereafter will be able to graduate under the current catalog or the *one* preceding catalog.

Degree Check

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.

GRADING

Passed/Not Passed Option

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 in the glass case 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 in the Commencement Program in June, 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 under Honors and Prizes in the Academic Information section.)

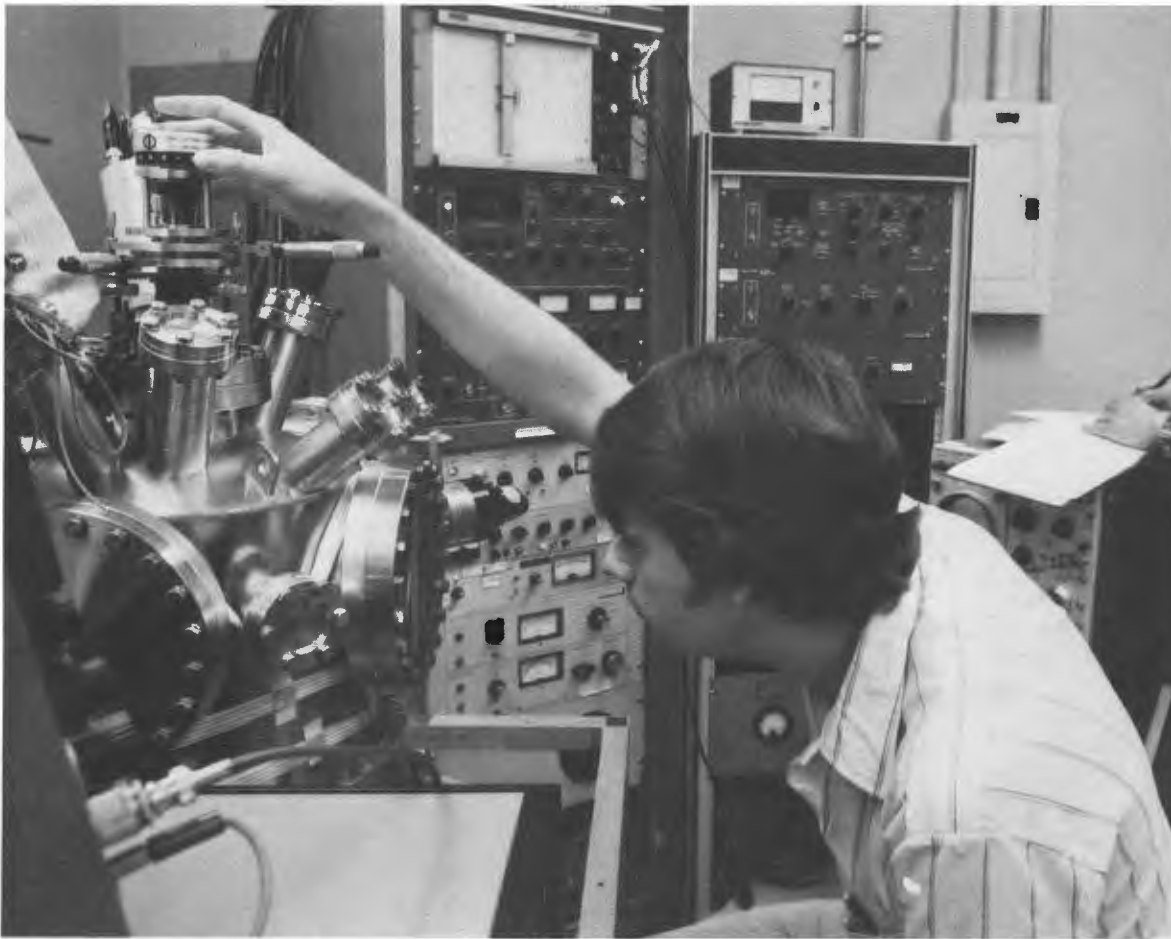
College Medal

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 and divisions 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.

- Aeronautical Science and Engineering
- Agricultural Engineering
- Applied Science (Davis-Livermore)
- Chemical Engineering
- Civil Engineering
- Computer Science
- Electrical and Computer Science Engineering



- Materials Science and 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 Science 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, Office of Graduate Affairs.

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, guide you in an exploration of 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, the General Education requirement, and the College's breadth and major requirements detailed in the Bachelor's Degree Requirements section of this catalog.

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.)



College of
Letters and
Science

STUDENT SERVICES

Information:
Letters and Science Advising Office
150 Mrak Hall
752-0392

The primary function of the Letters and Science Advising 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)

Provides a Status Card outlining the way in which transfer credit satisfies College and University requirements

The athletic facilities on this campus are excellent. The student-run Coffee House is great.

Graduate student, Botany

- Provides workshops and individual review to identify remaining College requirements (See Degree Check at the end of this section.)
- 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 minimum 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 decides whether such students can continue on academic probation or must be dismissed

ADVISING

Faculty Advising

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 explore many areas—some in depth—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 evolving interests, your academic and experiential background and your goals. 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 Letters and Science Advising Office for consultation on any academic matter.

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

- Before you complete 90 units of degree credit, including transfer work, you must develop in consultation with your faculty adviser a proposal for a quarter-by-quarter program of courses showing how you will meet your educational goals and the grad-

uation requirements. You must also have declared a major by this time (see The Major section below).

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 obtain a Degree Check (see the end of this section) from the Letters and Science Advising Office and consult your adviser concerning course selection and satisfaction of requirements in the major.
- Before you complete 195 units of degree credit, including transfer work, you must develop in consultation with your faculty adviser a firm study plan, in the form of a quarter-by-quarter program that will satisfy all remaining degree requirements as expeditiously as possible. This plan will be filed with your adviser. If the plan indicates that you will have to register beyond the 225-unit limit (see at the end of this section) in order to achieve your goals and to meet the degree requirements, you must contact the Letters and Science Advising Office immediately.

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

New students are assigned to a faculty adviser when the University receives their Statement of Intent to Register. If you indicated an interest in a particular program on your application 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*.

If you *did not* indicate an interest in a particular major program on your application for admission, you will participate in the **Academic Options Program** which is designed to provide academic advising to lower division students. You will be advised by a team of advisers: four faculty members who represent the four Letters and Science major areas, an academic counselor and a peer adviser. This advising team will be available in the Letters and Science Outreach Advising Offices located in each of the university residence hall complexes. Through one-on-one advising and group workshops and programs, this team will work with you to guide your academic planning to ensure progress toward your educational goals and satisfaction of your degree requirements. They will assist you in exploring your options before you select your major.

Students are assigned to the Academic Options Program adviser team located in their university residence hall complex. Students living off campus are asked to contact the Letters and Science Advising Office, 150 Mrak Hall, early in the quarter to receive their adviser assignments.

New students are encouraged to see their faculty adviser at least once every quarter during their first year on

campus to discuss their educational goals, course program, and progress.

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. During Orientation Week of the Fall Quarter, you should contact the regular faculty adviser you have been assigned.

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.

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. The College of Letters and Science student assistants to the Dean are available during regular office hours in 150 Mrak Hall to talk with students about their academic concerns. Refer to the index under "Advising" for information on the various peer advising programs throughout the campus.

Letters and Science Advising Office

Information:
150 Mrak Hall
752-0392

Deans and academic counselors are available by appointment and other advising personnel are ready to answer questions on a drop-in basis at the Letters and Science Advising Office. 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 counselors. **Peer advisers** in the Letters and Science Advising Office are prepared to answer most questions about College requirements. Student-to-student advising is an important part of the University advising services. Refer to the index under "Advising" for information on the other peer advising programs. **Preprofessional advising** is also available to Letters and Science students, even though the College does not offer special pre-professional programs. Students who plan to prepare for a professional school undertake a normal program leading to a bachelor's degree. Some 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, Pre-Law, and Pre-Business Advising Offices, or the Work-Learn and Career Planning and Placement Office.

TEACHING CREDENTIAL

The teacher education program is administered by the Graduate Division. See The Graduate Division section, Teacher Credential Programs, 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: Culture and Civilization (CC), Contemporary Societies (CS), and Nature and the Environment (NE). The appropriate category is indicated immediately following the major.



College of
Letters and
Science

Afro-American Studies (CS)
 American Studies (CC)
 Anthropology¹ (A.B. degree—CS; B.S. degree—NE)
 Applied Physics² (NE)
 Art History (CC)
 Art Studio (CC)
 Biochemistry² (NE)
 Biological Sciences¹ (NE)
 Botany¹ (NE)
 Chemistry¹ (NE)



Chicano (Mexican-American) Studies (emphasis
 Humanities—CC; emphasis Sociology—CS)
 Classical Civilization (CC)
 Comparative Literature (CC)
 Computer Science² (NE)
 Dramatic Art (CC)
 East Asian Studies (CC)
 Economics (CS)
 English (CC)
 French (CC)
 Genetics² (NE)
 Geography¹ (A.B. degree, emphases I, II, III, V—CS, emphasis
 IV—NE; B.S. degree—NE)
 Geology¹ (NE)
 German (CC)
 Greek (CC)
 History (CC)
 International Relations (CS)
 Italian (CC)
 Latin (CC)
 Linguistics (CC)
 Mathematics¹ (NE)
 Medieval Studies (CC)
 Microbiology¹ (NE)
 Music (CC)
 Philosophy (CC)
 Physical Education¹ (NE)
 Physics¹ (NE)
 Physiology² (NE)
 Political Science (CS)
 Political Science—Public Service (CS)
 Psychology¹ (NE)
 Religious Studies (CC)
 Rhetoric and Communication (CC)
 Russian (CC)
 Sociology (CS)
 Sociology—Organizational Studies (CS)
 Spanish (CC)
 Statistics¹ (NE)
 Women's Studies (CS)
 Zoology¹ (NE)

¹Offers a program leading to the Bachelor of Science degree as well as a program leading to the Bachelor of Arts degree.

²Offers the Bachelor of Science degree only.

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* in these areas now exist.

Declaration of Major

After an initial period of academic exploration, students are expected to focus their interests and declare a major by the time they have completed 90 units. If you have not declared a major by this point, a hold will be placed on your registration materials. 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 this catalog and the *Class Schedule and Room Directory* each quarter. As a part of the petitioning procedure, you must, in consultation with a faculty adviser, prepare a projected plan of study. You are accepted into the major when your adviser and the Dean have approved the petition. 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.

Individual Major

Students with academic interests not covered by an established major have the opportunity to develop an individual major. If you choose this option you will work closely with faculty advisers who have expertise in the requisite fields of interest to develop a coherent and rigorous academic program. This program of courses is then submitted to a faculty committee for review and approval. 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 under Individual Major in the Programs and Courses section of this catalog.

Multiple Majors

If you are interested in two or more areas of study, you may choose to satisfy the requirements of more than one major. Multiple majors offer the advantage of a systematic, in-depth approach to two or more disciplines. However, flexibility in planning your courses and exploring new areas of knowledge are restricted by the obligation to satisfy the requirements of more than one major. Students choosing to satisfy multiple major requirements notify the Dean's Office of their decision by submitting a petition endorsed by faculty advisers in the majors. The Dean's approval of the declaration of more than one major is subject to the following conditions:

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

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

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

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

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

1. *in the following group: Biochemistry, Biological Sciences, Botany, Genetics, Microbiology, Physiology, and Zoology;*

2. *offered by the same discipline, except Art History and Art Studio.*

A student who completes all requirements for approved multiple majors in which one major normally leads to an A.B. degree and another normally leads to a B.S. degree, will receive a B.A.S. degree. A single degree is granted to students who graduate with multiple majors.

Cross-College 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. Cross-college programs will not be approved if the majors involved are available within a single college as well. For example, cross-college programs between the Colleges of Letters and Science and Agricultural and Environmental Sciences will not be approved if one of the majors is Biochemistry, Biological Sciences, Botany, Genetics, Microbiology, Physiology, or Zoology.

Change of Major Within the College

You may change from one major to another within the College. Consent of the department or committee in charge of your proposed new major is required. Admission into a major program may be denied by the program or by the Dean if your grade-point average in courses required for the selected major is less than 2.000.

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

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

College of
Letters and
Science

The many dining facilities on campus are reasonable in price and offer a wide variety of food from junk to vegetarian.

**Senior,
Studio Art**

College of
Letters and
Science

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.

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 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

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. Many teaching departments and programs 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 requirements and have completion of the minor(s) certified on your transcript. 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. 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
- Chicano (Mexican-American) Studies
- Chinese
- Comparative Literature
- Dramatic Art
- East Asian Studies
- Education
- English
- French
- Geography
- Geology
- German
- Greek
- History
- Italian
- Japanese
- Latin
- Linguistics
- Mathematics
- Music
- Philosophy
- Physical Education
- Physics
- Political Science
- Portuguese

- Psychology
- Religious Studies
- Rhetoric and Communication
- Russian
- Sociology
- Spanish
- Statistics
- Women's Studies

Some departments and programs in the college 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.

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.

If you want to have completion of a minor certified on your transcript, you must obtain a Minor petition from the College Dean's Office and file it no later than the deadline for filing for graduation. Requirements for the minor must be met by the time of graduation. For specific deadlines, see the Academic Calendar at the front of this catalog.

DEGREE REQUIREMENTS

Each student is responsible for fulfilling all requirements for graduation. The University and Davis Campus General Education requirements can be found in the Bachelor's Degree Requirements section of this catalog. College requirements are listed below, including any restrictions in addition to the aforementioned requirements.

Unit Requirements

A minimum of 180 units is required for the bachelor's degree (see Unit Credit Limitations below). Of these units, 64 must be upper division units which include 48 units from Letters and Science teaching departments and programs. For the A.B. degree, a minimum of 12 of 48 units of upper division Letters and Science courses must be from outside the major department or program. All upper division General Education courses will be accepted in satisfaction of this requirement. Nonstandard courses (see Area Requirement List in this section) do not count toward these 12 units.

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.

Extension courses: 9 units maximum by petition.

Graduate courses: 9 units maximum by petition.

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.)

Passed/Not Passed Courses: Maximum of one-fourth of UCD units graded P taken at student's option. (See also the Academic Information section.)

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.)

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.

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 the Bachelor's Degree Requirements section in this catalog. (Work completed while enrolled in the Education Abroad Program does not satisfy campus or College Residence requirements.)

Scholarship Requirement

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. To obtain these minimal averages in the major, you may, *with approval from 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. Only grades earned in courses taken at UCD will be included in the grade-point computations.

English Composition Requirement

The English Composition requirement can be met in one of two ways:

1. by passing the English Composition Examination (see College Policies and Procedures) upon completion of 70 units of degree credit (the examination does not yield credit);

OR

2. by completing with a grade of C- (or P) or better
 - a. one course in English composition from English 1, 3, 20, Comparative Literature 1, 2, or 3;

AND

- b. English 102 or 103 (which must be taken after 84 units have been completed).

Breadth Requirements

The two requirements that comprise the breadth requirements are:

1. Foreign Language requirement

A.B. and B.A.S. degrees—the 15-unit level or the equivalent in one language. (For detailed information, see Foreign Language Requirement in this section.)

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 completed in 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 included on the Area Requirement List simultaneously satisfy both the College Area requirement and the General Education requirement.

Major Program Requirements

Requirements for major programs are described in the Programs and Courses section of this catalog. These requirements are fulfilled by completing a major program offered by a teaching department or program committee in the College of Letters and Science (see the list of majors) or an individual major program approved by the College's Committee on Individual Majors.

No more than 6 units in internship courses (numbered 92, 192, or similar 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 or course requirements in the major.

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 15, 150A, 150B.

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, 150.

Cantonese. (See restrictions on foreign language below.)

Classics.

Comparative Literature. All courses except *first* course taken from either 1, 2, or 3 (or English 1, 3, 5F, 5P). All subsequent courses in Comparative Literature may be counted toward humanities/fine arts.

Dramatic Art.

English. All courses except A, 21, 22, 23, 28, and *first* course taken from 1, 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 15 units of course work (course 3 or the equivalent in most languages offered on the Davis campus) in the language offered in satisfaction of foreign language requirement.

History.

Integrated Studies 2D, 8B.

Linguistics 1, 106, 107.

Medieval Studies.

Music.

Native American Studies 32, 33, 34, 55, 101, 156, 157, 181A, 181B, 181C.

Philosophy.

Religious Studies.

Rhetoric and Communication.

Social Sciences

Afro-American Studies 10, 100, 101, 110, 120, 121, 123, 133, 145A, 145B.

Agrarian Studies 2.

Agricultural Economics 141.

American Studies. (See Humanities and Fine Arts above.)

Anthropology. All courses except 1, 5, 15, 151, 152, 153, 154A, 154B, 155, 156, 157.

Applied Behavioral Sciences 2, 154, 178.

Asian American Studies 2, 100, 110, 111.

Chicano (Mexican-American) Studies 10.

Economics.

Education. All courses except 114.

Engineering: Civil 160.

Entomology 11.

Environmental Studies 1, 161, 165, 166.

Geography. All courses except 1, 3, 102, 105 through 117.

Integrated Studies 3A, 3B, 3C, 8C.
 International Agricultural Development 10.
 Linguistics. All courses except 1, 106, 107.
 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, 130, 134, 136, 150, 154, 165, 180B.
 Sociology. All courses except 46A, 46B, 106.
 Textiles and Clothing 7.
 Women's Studies 50.

Natural Sciences and Mathematics

Anthropology 1, 5, 15, 151, 152, 153, 154A, 154B,
 155, 156, 157, 158.
 Astronomy.
 Avian Sciences 13.
 Biochemistry and Biophysics.
 Biological Sciences. All courses except 19.
 Botany.
 Chemistry.
 Engineering 20.
 Engineering: Civil 30.
 Engineering: Computer Science 10, 30, 32, 40,
 100, 110, 120, 122, 140, 170.
 Engineering: Electrical and Computer Science
 171.
 Entomology 10, 100.
 Environmental Studies 30.
 Food Science and Technology 2.
 Genetics.
 Geography 1, 3, 108, 110, 112, 115, 116, 117.
 Geology.
 Human Anatomy 101.
 Integrated Studies 1A, 1B, 8A.
 Mathematics.
 Microbiology.
 Nutrition 10.
 Physical Education 101, 102, 103, 110, 111, 112,
 113, 115.
 Physics.
 Physiology.
 Psychology 15, 41, 103, 105, 108, 129, 130, 131,
 134, 136, 150, 154, 180B.
 Resource Sciences 2, 131.
 Statistics.
 Textiles and Clothing 110.
 Wildlife and Fisheries Biology 10.
 Zoology. All courses except 150.

Foreign Language Requirement (A.B. and B.A.S. degrees)

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.

You may validate your knowledge of a language learned in high school by taking this test. A test may not be taken, however, in a language for which you have already received degree credit. If you are a transfer student, consult your *Status Card*, which is issued by the Dean's Office prior to admission to the College.

2. *College Board Achievement Test.* Earning a qualifying score of at least 500 on a College Board Foreign Language Achievement Test satisfies the requirement. This test may be taken at any time during your high school career. Once your score is on file at the Undergraduate Admissions Office notify the Letters and Science Dean's Office so that satisfaction of the College requirement can be noted on your record.

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

4. *Course Completion in College (or the equivalent).* A.B. degree—15-unit level in one language (e.g., Spanish 3 or Japanese 3). B.S. degree—as required in the major program.

If you have successfully completed (C– or better) the second or third year of a language in the tenth or higher grade in high school you may receive unit credit for course 1 of that language on a P/NP grading basis only.

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.

Change in Requirements

On occasion, the faculty makes changes in the requirements that students must satisfy to obtain the baccalaureate degree. So that you will not be penalized by changes that may work to your disadvantage and so that you will benefit by changes that assist you in completing your degree requirements, it is College policy that you may choose to fulfill the University and College requirements (see General Education requirement for an exception) as stated in any UCD General Catalog in effect at any time you were enrolled in a postsecondary institution of higher education (i.e., community college, college, or university). Once you

have chosen the year of the General Catalog under which you wish to be governed, you must satisfy all of the University and College requirements specified in that catalog.

With respect to the completion of your major requirements, most of the majors in the College of Letters and Science require completion of the major degree requirements in effect at the time you officially declared your major. However, because departments differ in how these matters are handled, check with the department or major program office if you have any questions about which requirements are applicable to you.

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.

CREDIT FOR COURSES

Advanced Placement Examinations. For credit allowed and course equivalencies on units earned through Advanced Placement Examinations, see the College Board chart in the Academic Information section.

Education Abroad Program. Full University credit may be awarded for courses taken through the Education Abroad Program. See the Introduction section in this catalog for eligibility requirements and application deadlines.

Extension Courses. Students may apply credit earned in University Extension courses toward the 180-unit requirement, only when written approval has been obtained from the Dean *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. Undergraduates may enroll in graduate and professional courses in the 200, 300 and 400 series under the following conditions.

- Graduate courses in the 200 series are ordinarily open only to students who have completed at least 18 units of upper division work basic to the subject matter of the course.
- Admission to graduate and professional courses must be approved by the instructor in charge of the course.

Graduate and professional courses completed will be listed on the student's transcript in the usual manner. However, the units earned may be counted toward degree requirements only under the following conditions.

Within the limitations 1, 2, and 3 below, an undergraduate student in the College may count up to 9 units in graduate 200 series courses, and up to a combined total of 9 units in 300 and 400 series professional courses, toward degree requirements. These units, however, are not counted as upper division units unless this is granted by petition to the Dean.

1. The recommendation of the instructor of the course and the department chairperson—in addition to approval from the Dean—must be obtained by

petition in order to receive unit credit toward the degree for the following kinds of courses:

- all graduate courses 200-298 whether offered by a department or program outside of or within the College of Letters and Science
- all professional courses 300-398 for teachers offered outside of the college of Letters and Science
- all postgraduate professional courses 400-498 offered outside of the College of Letters and Science
- all variable unit courses 300-398 and 400-498 offered within the College of Letters and Science.

2. The minimum eligibility conditions for an undergraduate in the College to petition for degree credit for a 200, 300 or 400 series course are a UC grade-point average of 3.3 and completion of 18 upper division units basic to the subject matter of the course. These eligibility conditions may be waived, however, upon the recommendation of the course instructor and concurrence of the department chairperson if the student's preparation warrants exception.
3. Undergraduates in the College cannot receive degree credit for special study courses numbered, 299, 399 or 499.

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 situations, and to test their career objectives. The Work-Learn and Career Planning and Placement Office has information on internships available or can help you develop one.

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 the section on Academic Information.) See also, the section on Repetition of Courses in the Academic Information section of this catalog, especially regarding computing the grade-point average for the first 16 units of repeated courses and thereafter.

Transfer Courses in English Composition. Transfer courses considered by the Dean to be equivalent or comparable to English 1, 3, 20, 103A-G, or Comparative Literature 1, 2, 3 will be accepted toward satisfaction of the English Composition requirement. Note that English 103 or the equivalent must be taken after you have completed 84 units of transferable degree credit.

If your transfer work does not include an acceptable English composition course taken after you had completed or accumulated 84 units, you may fulfill the requirement by examination (see below) or take English 102 or 103 at Davis.

ENGLISH COMPOSITION EXAMINATION

The English Composition requirement can be met with a passing score in the English Composition Examination. No fee is charged and no unit credit is given for the examination.

This academic year, the no-fee examination will be offered on the following Saturday mornings:

October 29, 1988

January 28, 1989

April 29, 1989

If you take this examination, you must do so after having completed 70 units. There are no examinations administered during the summer.

Sign-up rosters will be posted on the College of Letters and Science's bulletin board, Mrak Hall foyer, Monday through Thursday (or until filled) just preceding each Saturday examination date.

The English Composition Examination form, available at the UCD Bookstore, is required.

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 the Academic Information section in this catalog.

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.

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.

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 and insure that you get the most out of your remaining education and complete all graduation requirements as well, you should know what requirements remain unsatisfied. To help you in these efforts, the College requires that you obtain (1) a degree check from the Dean's Office by attending a special workshop and (2) a check of major require-

ments from your faculty adviser before you accumulate a total of 135 units of degree credit.

If you have not completed these two aspects of the degree check before you complete 135 units of degree credit, a hold will be placed on your registration materials.

UNIT LIMITATIONS

Ordinarily, a full-time student takes 12 to 15 units a quarter. (Note the Minimum Progress requirements in the Academic Information section.) In order to graduate in four years you need to complete 15 units a quarter.

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**

The Dean's Honors List recognizes the academic achievements of students who have

1. completed at least 12 units for a letter grade during that quarter;
2. earned a grade-point average, for that quarter, that places them in the upper 16 percent of the students registered in their 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 the Academic Information section in this catalog.

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

The college also nominates graduates with distinguished academic records for the University Medal.

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, used extensively at Davis, permits faculty to be affiliated with graduate programs in more than one discipline and offers students flexibility and breadth by crossing the administrative boundaries of the various departments, colleges, schools and sometimes campuses. 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 AND CERTIFICATE PROGRAMS AT DAVIS

The following advanced degrees are offered at UC Davis: Master of Administration, 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 Management
Agricultural and Environmental Chemistry (M.S., Ph.D.)
Agricultural Economics (M.S., Ph.D.)
Agricultural Education (credential)
Agronomy (M.S.)
Anatomy (M.S., Ph.D.)
Animal Behavior (Ph.D.)
Animal Science (M.S.)
Anthropology (M.A., Ph.D.)

Applied Mathematics (M.S., 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.)
Computer 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., credential)
Endocrinology (M.S., Ph.D.)
Engineering (M. Engr., M.S., D.Engr., Ph.D.)
English (M.A., Ph.D.)
Entomology (M.S., Ph.D.)
Exercise Science (M.S.)
Food Science (M.S.)
French (M.A., Ph.D.)
Genetics (M.S., Ph.D.)
Geography (M.A., Ph.D.)
Geology (M.S., Ph.D.)
German (M.A., Ph.D.)
History (M.A., M.A.T., Ph.D.)
History of Art (M.A.)
Horticulture (M.S.)
Human Development (Ph.D.)
Immunology (M.S., Ph.D.)
International Agricultural Development (M.S.)
Law (J.D.)—refer to School of Law
Linguistics (M.A.)
Master of Education (M.Ed.)
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.S., 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 and Communication (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.)

The Graduate
Division

***I believe
that UCD is
one of the
finest
schools
anywhere,
and I
would
definitely
do it over
again if
given the
chance.***

*Graduate
student,
Agriculture*

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
Agricultural Education
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
Computer Science
Earth Sciences and Resources
Ecology
Endocrinology
Engineering
Exercise Science
Food Science
Genetics
Horticulture
Human Development
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 ADMISSION

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. In general, 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 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 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 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 the Academic Calendar at the front of this catalog). 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 ap-

plicants 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 copies of all transcripts in English are required before your application can be processed. 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, CN6151, Princeton, NJ 08541-6151. 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 under International Student Services in Student Life section for complete details). Prior to registration, you will be required to sign 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 if the courses were taken at another campus of the University—providing the units were not used to satisfy requirements for another degree.

A master's degree may be awarded upon completion of one of two basic plans in which either a thesis or a comprehensive examination is required.

Ph.D. Degree

The Doctor of Philosophy degree, as granted at the University of California, means that the recipient possesses knowledge of a broad field of learning and has given evidence of distinguished attainment in that field; it is a warrant of critical ability and powers of imagination and synthesis. It means, too, that the candidate has presented a dissertation containing an original contribution to the knowledge of the chosen field of study.

Students working toward a doctorate must be registered and in University residence for a minimum of six regular quarters. Experience indicates that it takes considerably longer than this to complete a degree program. Two consecutive regular Summer Sessions may count as the equivalent of one regular quarter.

There is no University unit requirement for the doctoral degree. However, individual programs have course requirements 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.

The qualities which initially drew me to UCD were a high academic reputation combined with congenial professor-student relations set in an environmentally concerned, small community.

*Graduate student,
Mechanical Engineering*

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 enrollment 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 under Fees and Expenses in this catalog. Application forms are obtained at the Graduate Division Office. See the Academic Calendar 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. International students are not eligible for fellowship consideration until they have completed one year as a graduate student at UC Davis. Information regarding graduate fellowships, which are supported by various federal and outside agencies, is available at the Graduate Division.

A limited number of Tuition Fee Fellowships are awarded each year to new and continuing international students based on academic merit. The available fellowships are allocated to graduate programs which choose individual recipients from among their graduate students. These fellowships are for the full amount of the non-resident tuition. A minimum grade-point average of 3.25 is required for eligibility. Application forms for Tuition

Fee Fellowships are available at the Graduate Division Office, and must be filed with that office by April 1. International students are not eligible for a restricted fellowship unless they have completed at least 18 units of graded coursework at UC Davis. A limited number of tuition fellowships will be available to first-year international students. Students receiving any funding from a government or other outside agency, whether or not the fees are paid directly to the University of California, are not eligible for a Tuition Fee Fellowship.

Teaching assistantships and research assistantships are available in many departments. Interested students should inquire at the office of the program in which they wish to study.

The Financial Aid Office has information about loans and work-study for graduate students.

TEACHER CREDENTIAL PROGRAM

The teacher education program at UC Davis is administered by the Graduate Division.

Acceptance into the *multiple-subject (elementary) teaching credential program*, with either a regular or a 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 two following alternatives:

- the additional requirements for the approved UC Davis Diversified Waiver Program; OR
- achieving a passing score on the National Teachers Examination (General Knowledge section only).



California state single-subject (secondary) teaching areas for which Davis students can qualify are: agriculture, 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 requirements for these state single subjects, or state-approved examinations available to test competence in subject areas, consult the appropriate adviser in the Departments of Education or Applied Behavioral Sciences.

While admission to the teacher education program is by the Graduate Division, 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. A scholarship record of B (3.0) is required for admission to the program.

- A passing score on the California Basic Educational Skills Test (CBEST) must be achieved prior to the Graduate Division application deadline.

The teacher education program is available to upper division students also. With careful planning, it is possible for students to finish the requirements for a non-renewable preliminary credential at the same time the bachelor's degree is completed. This credential allows recipients to teach for five years, but within that time an additional ("fifth") year of study must be completed for the professional 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



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:

- 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 (Spanish) Emphasis—Elementary (D, I, LA, R, SB, SC, SD)
 - Secondary Teaching (B, D, I, LA, R, SB, SC)
 - Bilingual (Spanish) Emphasis—Secondary (I)

- Special Education (B, I, LA, R, SB)
- Pupil Personnel Services: Basic (Counseling) (B, I, LA, R, SB)
- Agricultural Specialist Teaching (D)
- Bilingual (Spanish) Specialist (D, SB)
- Reading Specialist (B, LA, R, SB)
- School Librarianship (B, LA)
- School Psychology (B, D, LA, SB)
- Clinical-Rehabilitative Services (SB)
- Administrative (B, I, LA, R, SB)
- Early Childhood Specialist (I)
- Administration (B, LA)
- Graduate School of Journalism (B)
- Graduate Schools of Management (D, I, R)
- 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)

Professional
School
Preparation

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.

MANAGEMENT

The UC Davis **Graduate School of Management**, which enrolls its eighth class in the fall of 1988, offers a two-year program of study in management and policy analysis leading to the Master of Administration degree. (See the School of Management section for details.)

The Recreation Hall and health services are wonderful.

Law student

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 (381 Kerr Hall, 752-0741) or Agricultural Economics (125 Temporary Building-8, 752-6185); or see the Pre-Business School (Peer) Adviser located in 359 Kerr Hall, 752-6512.

TEACHING CREDENTIALS

Preparation for Study: Those interested in preparing to be a teacher should know that the majority of students complete a teaching credential as part of a graduate program. However, there is significant work that may be done as an undergraduate, including prerequisites or other courses related to schools and children. This not only prepares students more adequately for the credential year, it relieves the stress of an already-crowded graduate professional year.

Advising: It is highly recommended that students consult the appropriate advising office as early as possible. All credential advising except Agriculture is done in the Student Advising Office of the Education Department, 174 Kerr Hall (752-0757). Students interested in teaching Agriculture should go to the Department of Applied Behavioral Sciences in Academic Office Building-4 (752-1808).

Application: Students normally apply for the graduate credential program early in their senior year. See the Teacher Credential Program in the Graduate Division section of this catalog for additional information about acceptance into a credential program.

FORESTRY

Preparation for Study: Consult this catalog and the announcement of the Department of Forestry and Resource Management, UC Berkeley.

Preforestry adviser: C.C. Delwiche (Land, Air and Water Resources, 273 Hoagland Hall, 752-1511 or 752-1409).

LAW

Preparation for study: Consult this catalog, school announcements, and *The Official Guide to U.S. Law Schools*, prepared and published by the Law School Admission Council/Law School Admission Services.

Advising: Students interested in law school preparation should consult the Pre-Law Adviser, Pre-Law Advising Office, 108 South Hall, 752-3009. Information is available about law school admission procedures, academic program planning (see also under Advising Services), and professional possibilities.

School of Law, UC Davis: Consult this catalog, 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 practitioner, physician assistant, 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 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, campus or 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 6A, 6B, 6C.

Mathematics: none required for California state license. Calculus (Mathematics 16A-16B) and statistics (Statistics 13) recommended.

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); Physiology 110-110L; virology (Veterinary Microbiology 128 or Microbiology 162); histology (Zoology 122).

Suggested electives:

Genetics (Genetics 100); Human Anatomy 101; advanced immunology (Veterinary Microbiology 270); computer programming (Engineering 5, Computer Science Engineering 10, or 30); 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; Microbiology 2-3.

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 6A-6B-6C.

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 100; 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. The Graduate Record Exam (GRE) or Graduate Management Aptitude Test (GMAT) is required for admission to most schools. Contact the school of your choice for particular requirements. Elective courses may be selected from the following subject areas:

- Agricultural Economics.
- Applied Behavioral Sciences.
- Biological Sciences.
- Community Health.
- Economics.
- Engineering.
- Epidemiology and Preventive Medicine.
- Food Service Management.
- History.
- Mathematics.
- Statistics or Agricultural Science and Management, Computer Science Engineering.
- Political Science.
- Psychology.
- Rhetoric.
- Sociology.

Medicine

Most students complete four years of preprofessional coursework prior to admission to medical school. Any major is appropriate for admission. 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



Professional School Preparation

Office, South Hall, for specific requirements for each school. The following courses are required by most schools.

Biological sciences: six quarters, including one year of laboratory. (Biological Sciences 1, Zoology 2-2L, Physiology 110, 110L, Microbiology 2 or 102, and 3 recommended).

Chemistry one year general inorganic (Chemistry 1A-1B-1C) and one year organic, with laboratory (e.g., Chemistry 128A-128B-128C and 129A-129B-129C).

Physics: one year, with laboratory (e.g., 6A-6B-6C).

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:

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

English 1.

Human Anatomy 101, 101L.

Microbiology 2 or 102, and 3.

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 and Communication 3; Physics 6A, 10; Family Practice 92C, 192B; Community Health 101; Biological Sciences 19, Psychology 16B; Sociology 127, 154.

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 6A-6B-6C, 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 92C, 192B; Rhetoric and Communication 1, 3; Microbiology 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 participate in the Optometry Admission Testing Program, 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;

Microbiology 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 two quarters of organic with laboratory (e.g., Chemistry 8A, 8B). 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.

Physics 6A-6B-6C.

Psychology: two courses, Psychology 1 and one upper division course (e.g., Psychology 112, 168).

Suggested electives: economics, sociology, biochemistry, additional biological sciences, additional statistics.

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).

Zoology 2-2L, 100; Microbiology 2 or 102, 3; Biological Sciences 1; Botany 2.

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. UOP B.S. degree program has general education requirements but does not require organic chemistry.

Economics. One macroeconomics course (Economics 1B).

English, one year: one each of composition, literature and one other.

Mathematics 16A-16B (-16C required by some schools) and Statistics 13 (recommended).

Physics: one year physics with laboratory (Physics 6A-6B-6C).

Psychology: one course, such as Psychology 1.

Rhetoric and Communication 1, 3 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. Most graduate programs require the Graduate Record Exam (GRE) for admission. General requirements include:

Biological Sciences 1.
Chemistry: 1A, 1B, 1C. Recommended: 8A, 8B.
Computer Science Engineering 10. Required by some schools.
English, one year.
Human Anatomy 101, 101L.
Physics, one year.
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; Microbiology 2 and 3; Sociology 1, 3; Zoology 2-2L, 106, 143; Anatomy 215; Physical Education 101, 102, 103, 105, 113, 125, 131; Rhetoric and Communication 1, 3; Community Health 101; Family Practice 192B; additional psychology, and additional biology.

Physician Assisting

Physician assistant programs often require courses in English composition, sociology, psychology, chemistry, anatomy, physiology, microbiology, mathematics, and cultural anthropology. 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.



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School of Medicine, UC Davis: Consult 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, 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.

Admissions to Schools and Colleges of Optometry, published by the American Optometric Association.

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 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. In addition to the traditional professional curriculum, the School provides professional skills training in interviewing and counseling, negotiation and dispute resolution, and trial practice. It also offers opportunities for practical experience through clinical programs and for in-depth study of an area of law in an individualized program of classroom work, research, writing, or experience in the community. The School seeks to promote critical evaluation of law and legal institutions in a broad perspective, integrating non-legal disciplines with professional legal education.

The School is fully accredited by the American Bar Association, is a member of the Association of American Law Schools, and has a chapter of the Order of the Coif.

Preparation for the Study of Law

No specific college major is required for admission to the School of Law, and there is no prescribed pre-legal program. Your college record and Law School Admission Test (LSAT) score must, of course, demonstrate that you are highly qualified for the study of law.

As a pre-law student, you should plan a course of study that will give you a broad cultural background and include intensive work for a substantial period of time in a selected field of study. Pre-law students should develop the ability to think critically. They should gain an understanding of people and institutions and know how to gather and weigh facts, to solve problems, and think creatively. They should be able to read rapidly with comprehension, and express themselves clearly, completely, and concisely, both orally and in writing.

Assistance in program planning may be obtained from the Pre-Law Advising Office, South Hall, 752-3009.

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 all ABA approved 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 must show a record of sufficiently high caliber to demonstrate your ability to handle the rigors of law study. 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 and considers ethnic and economic factors, advanced degrees or other advanced studies, significant work experience, and extracurricular and community activities during and after the college years. An applicant's growth, maturity, and commitment to the study of law are also major considerations.

Students are admitted only on a full-time basis and *only in August*.

Law School Admission Test (LSAT)

All applicants are required to take the Law School Admission Test administered by 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: February, June, October, and December. If at all possible, you should take the test by October, and in any event not later than December, for admission the following fall. The completed test application blank, accompanied by the fee, must be post-marked at least 30 days before the date of the test to 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. Applications received after February 1 will be considered but because applicants are admitted as promptly as possible, late applicants will be at a disadvantage.

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

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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 below), 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 great need for minority lawyers. The School, therefore, actively solicits applications from

Asian, Black, Hispanic, Native American, Pilipino, and other minority students.

The School of Law, in cooperation with the Association of American Law Schools (AALS) and the Council on Legal Education Opportunity (CLEO), participates in programs designed to increase the number of 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.

Scholarships for Indian and Alaskan natives are available from American Indian Scholarships, Inc., 5106 Grant Avenue N.E., Albuquerque, New Mexico 87108. Applicants must be members of federally recognized Indian tribes or Alaskan native villages and must demonstrate need. The deadline for the fall term is June 1.

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 stu-

I had an opportunity to develop some life-long friendships because of the friendly and relaxed atmosphere on and off campus.

Law student



dents only; no part-time or evening program is offered. New students are admitted only at the beginning of the Fall Semester.

After satisfactorily completing the professional curriculum of 88 semester units, and the required period of resident study, you will receive the degree of Juris Doctor.

The first year's work is prescribed and provides the essential foundation for subsequent legal study. Satisfactory completion of the first-year courses is, in all cases, prerequisite to second- and third-year courses. The work of the second and third years is elective. Students who fail to attain satisfactory grades may be required to withdraw from the School at the end of any academic year.

Courses taken in summer sessions at other accredited law schools may, with prior permission, be credited toward the units required for the professional degree.

The courses of the professional curriculum are listed in the Programs and Courses section of this catalog.

Combined Degree Programs

Students with interests in areas such as anti-trust, business, labor law, criminal law, or environmental law, may find a combined degree involving law and another discipline such as economics, business, sociology, or science advantageous. In order to encourage this kind of study, the School, in conjunction with other schools and University departments, has established Combined Degree Programs. Under these programs, a student may work toward a J.D. degree and a master's degree in another discipline at the same time. In some instances it may be possible to work on a Ph.D. degree as well.

Normally, a Combined Degree Program will take at least four years. You will usually be able to earn up to 10 semester-hours of law school credit for work in the related discipline and normally can complete the combined degrees in less time than it would take to earn the two degrees separately. The first year of the Combined Degree Program must be taken entirely in the School of Law. During the remaining years, 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 1988-89

	Fall 1988	Spring 1989
First-year Introductory Program	Mon-Fri, Aug 15-19	
Law School instruction begins	Mon, Aug 22	Tues, Jan 17
Labor Day holiday*	Mon, Sept 5	
Thanksgiving holiday period*	Thurs-Fri, Nov 24-25	
Martin Luther King, Jr. holiday*		Mon, Jan 16
President's Day holiday*		Mon, Feb 20
Spring recess		Mon-Fri, Mar 20-24
Law School instruction ends	Fri, Dec 2	Fri, May 5
Reading period	Sat-Wed, Dec 3-7	Sat-Fri, May 6-12
Law School examination period	Thurs-Thurs, Dec 8-22	Sat-Fri, May 13-26
Last day of semester	Thurs, Dec 22	Fri, May 26
Law School Commencement		Sat, May 27

*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 Management



Information:
Graduate School of Management
390 Voorhies Hall
752-7399

Graduate
School of
Management

PREPARATION FOR THE STUDY OF MANAGEMENT

A bachelor's degree and a strong interest in professional management are prerequisites for admission to the Graduate School of Management. The school seeks students from diverse professional and academic backgrounds and does not limit its consideration to applicants from any particular category of majors. Entry-level and mid-career applicants are considered, and women and minorities are encouraged to apply.

Although the program has no specific subject prerequisites, it is strongly recommended that students complete the following coursework prior to enrollment in the program:

Economics—the introductory courses in micro- and macroeconomics, and one upper division course in microeconomics (Economics 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.

APPLICATION

Admission is for the Fall Quarter only. Application materials may be obtained from the Graduate School of Management and must be completed and returned, with all supporting documents, by *April 1*. In order to allow the timely processing of your application, we have established a deadline of April 1. However, your application may be considered after the deadline. Completed applications for fellowship and graduate scholarships must be filed by *January 15*.

As indicated in the application form, the basic documents required are:

- transcripts from all institutions of higher education previously attended;
- scores from the Graduate Management Admission Test (GMAT);
- three letters of recommendation;
- a personal statement which discusses career objectives and educational reasons for seeking admission to the program.

Personal interviews are not a requirement, although visits from applicants are welcomed.

CRITERIA FOR ADMISSION

The major criterion of the committee granting admission is what an applicant has to gain from, and offer to, the program. Consideration of an applicant's undergraduate performance includes a review of trends in scholastic performance and areas of academic strength as well as an assessment of overall grade-point averages. Admissions standards and grading policies of the schools

attended are also considered. Both verbal and quantitative scores on the GMAT are used to evaluate measurable general aptitude for management. Background and maturity as indicated by employment history, service and activity records, recommendations, and the applicant's personal statement are factors in the committee's evaluation. Professional management experience is not required for admission but is favorably considered.

The Graduate School of Management 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 Management 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, finance, and organizational theory. During the second year, students specialize in one of several concentrations including Accounting, Agricultural Management, Environmental and Natural Resource Management, Finance, Management Information Systems, Management Science, 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. The Graduate School of Management is able to accept well-qualified students into an individualized Ph.D. program. The program is administered by the Graduate Division, but students who are interested should write directly to the Graduate School of Management.

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 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.

ADMISSION POLICIES

The class entering in the fall of 1988 will be limited to ninety-three students selected on the basis of academic achievement, academic promise, and personal characteristics. The Admissions Committee uses these criteria to determine if a candidate will be able to complete satisfactorily the requirements of the medical curriculum and become excellent medical practitioners. Factors taken into consideration include scholastic records, Medical College Admission Test performance, and reports of teachers, advisers, and interviewers with regard to intellectual capacity, motivation, emotional stability, and personal dedication.

The majority of openings in the entering class will be awarded to students who are legal residents of the State of California. The School of Medicine participates in the program of the Western Interstate Commission for Higher Education (WICHE). 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 usually required before a place in the first-year class can be offered. However, because of the large number of applicants, it is not possible to interview each one, and for this reason interviews are held only at the invitation of the Admissions Committee. 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

I'm very impressed by the extensive counseling and advising services that are available to us.

Medical student

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

The School of Medicine requires all candidates to take the Medical College Admission Test (MCAT). 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, coursework 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). Required courses may not be taken on a Passed/Not Passed basis unless all courses at your undergraduate institution are graded this way.

The average accepted student has considerably higher numbers. The admissions committee may, therefore, elect to screen applicants at a level higher than these published minimum levels.

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.

School of Medicine Calendar 1988-89

The School of Medicine operates on a different schedule from the remainder of the campus. A more detailed academic calendar may be obtained from the Office of Curricular Support, 2427 Medical Sciences 1A.

SUMMER QUARTER 1988

Medical School instruction begins for 3rd- and 4th-year students	Mon, June 27
Medical School instruction begins for 2nd-year students (electives only)	Tues, July 5
Medical School instruction begins for 2nd-year students (regular curriculum)	Mon, Aug 1
Medical School instruction ends for 2nd-year students	Mon, Sept 12
Medical School instruction ends for 3rd- and 4th-year students	Fri, Sept 16
Academic and administrative holidays	Mon, July 4 Mon, Sept 5

FALL QUARTER 1988

Medical School instruction begins for 3rd-year students	Mon, Sept 19
Medical School instruction begins for 4th-year students	Mon, Sept 26
Medical School instruction begins for 1st- and 2nd-year students	Thurs, Sept 29
Medical School instruction ends for 1st-, 2nd-, and 3rd-year students	Fri, Dec 9
Medical School instruction ends for 4th-year students	Fri, Dec 16
Academic and administrative holidays	Thurs-Fri, Nov 24-25 Fri-Mon, Dec 23-26 Fri-Mon, Dec 30-Jan 1

WINTER QUARTER 1989

Medical School instruction begins for 2nd-, 3rd-, and 4th-year students	Tues, Jan 3
Medical School instruction begins for 1st-year students	Thurs, Jan 5
Medical School instruction ends for 2nd-year students	Mon, Mar 13
Medical School instruction ends for 1st-year students	Wed, Mar 15
Medical School instruction ends for 3rd- and 4th-year students	Fri, Mar 24
Academic and administrative holidays	Mon, Jan 16 Mon, Feb 20

SPRING QUARTER 1989

Medical School instruction begins for 2nd-, 3rd-, and 4th-year students	Mon, Mar 28
Medical School instruction begins for 1st-year students	Mon, April 3
Medical School instruction ends for 2nd-year students	Tues, May 23
Medical School instruction ends for 4th-year students	Thurs, June 8
Medical School instruction ends for 1st-year students	Fri, June 9
Medical School instruction ends for 3rd-year students	Fri, June 16
Academic and administrative holidays	Mon, Mar 27 Mon, May 29

School of Veterinary Medicine



School of
Veterinary
Medicine

Information:
School of Veterinary Medicine
114 Haring Annex
752-1383

UC Davis is an excellent school; I recommend it to everyone. Davis has something special that enables you to fit in and feel at home.

*Veterinary
Medicine
student*

The Doctor of Veterinary Medicine (D.V.M.) degree is granted upon completion of a course of study that usually requires six years. The final four years must be spent in the professional veterinary medical curriculum. Many 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 have completed 108 quarter units (72 semester units) in an accredited college or university before entering the School of Veterinary Medicine. Courses taken at other institutions may vary in units.

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. Substantial experience with animals, which should include working with veterinarians, is required. This experience should entail more than having had family pets. The requirement can be fulfilled with 4 1/2 week-equivalents (180 hours) if it includes relevant experience with types of activities that give an appreciation and understanding of the profession of veterinary medicine. This should include experience with several animal species so as to understand the breadth of the profession. The Admission Committee will evaluate animal experience qualitatively. Evaluation of animal experience is derived from the application, narrative and letters of evaluation. *The experience requirement must be met in order to have an application evaluated by the Admission Committee.*

	Quarter Units
Subject Requirements	
Science courses	46
<i>Lower Division</i>	
Chemistry (general, qualitative, organic, including laboratories)	21
Physics (general, no laboratory required)	6
Biology and zoology (including laboratories)	11
<i>Upper Division</i>	
Genetics (no laboratory required)	4
Embryology (no laboratory required)	4

English composition and additional English or rhetoric	12
Statistics	4
Humanities and/or social sciences	12
Total	74

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

	Units
<i>Lower Division</i>	
Biological Sciences 1	(5) 5
Chemistry 1A, 1B, 1C, 8A, 8B	(5,5,5,3,3) 21
Physics 1A, 1B	(3,3) 6
Zoology 2-2L	(4,2) 6
English 1 and additional English or Rhetoric and Communication	(4,4,4) 12
Statistics 13 or Agricultural Science and Management 150	(4,4) 4
Humanities and/or social sciences	(4,4,4) 12
<i>Upper Division</i>	
Genetics 100	(4) 4
Zoology 100	(4) 4
Total	74

If you complete the requirements in an institution other than the University of California, Davis, you are urged to check carefully the catalog of your college to be sure you are taking courses comparable in content.

Application Procedures

Students are admitted to the School of Veterinary Medicine only in the fall. Application forms may be obtained any time after July 1 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 must be received by this office no later than *November 1*. All applicants are required to take the General Aptitude and Subject Test in Biology of the Graduate Record Examination (GRE). GRE SCORES RECEIVED FROM THE NOVEMBER ADMINISTRATION OR LATER ADMINISTRATIONS FOR THE YEAR THE APPLICATION IS FILED WILL NOT BE ACCEPTED FOR CONSIDERATION. Applications for the examinations and additional information may be obtained from the Educational Testing Service, Box 1502, Berkeley, CA 94701.

The GRE must be taken within the five-year period prior to the time the application is submitted. The highest scores will be used when the GRE is taken more than once.

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 two

years of undergraduate studies. The scores from the Graduate Record Examination are included in the evaluation of your academic record. The principal nonacademic criteria are your narrative statement, letters of evaluation, and personal interview. 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 in both the required science units and the cumulative undergraduate work.

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—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 in the Statement of Legal Residence in the Appendix. 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 the Bachelor's Degree Requirements section in this catalog), 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
- Complete the bachelor's degree requirements in one of the colleges or schools of the University of California or at another accredited college or university
- 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; final admission decisions rest with the Admissions Committee, MPVM program. 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 Coordinator, MPVM Program, School of Veterinary Medicine, University of California, Davis, CA 95616.

Candidates for the MPVM degree must satisfactorily complete a total of 50 units of coursework while in residence. This includes 28 units of core required coursework, 10 units of research in a field appropriate to the chosen option, and additional units of approved elective courses. One requirement of the MPVM program is to complete a research study which culminates in a written

report and oral presentation. A committee, consisting of three faculty members, reviews each paper for acceptability and assigns an appropriate grade.

The degree program extends over a minimum of twelve months to a maximum of two years. Students who intend to complete the program in one calendar year must enroll in August unless they have recently completed and performed satisfactorily in a statistics course that has been approved by the MPVM Graduate Adviser and the Epidemiology and Preventive Medicine 400 instructor 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 and advisers are as follows:

1. *Epidemiology and Herd Health Management*
(statistics, epidemiology, animal health economics, and disease control)

Adviser:
D. W. Hird

2. *Veterinary Public Health*
(veterinary medicine applied to food safety and zoonoses)

Adviser:
C. Genigeorgis

3. *Laboratory Services*
(roles of diagnostic laboratories in animal disease surveillance and disease control)

Adviser:
K. M. Lam

4. *Veterinary Programs Administration*
(administration of programs for control of animal diseases, veterinary laboratories, research, or educational veterinary service)

Adviser:
C. W. Schwabe

Inquiries regarding the program should be directed to the Coordinator, 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



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; 190. Proseminar in International Agricultural Development (1)
instructor(s) I, II, III. The Staff

Paragraph Seminar—1 hour. Presentation and discussion of current topics
following: in international agricultural development by visiting lecturers,
course setup; staff, and students. May be repeated for credit. (P/NP grading
prerequisite; only.)
description;
grading if other
than letter grading.

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 1987 would be an odd-numbered year and Winter and Spring Quarters 1988 would be even-numbered years.

A series of course numbers followed by two or three letters (for example, Animal Science 49A-49B-49C) is continued through three successive quarters, ordinarily from September to June. The first quarter course listed this way is a prerequisite to the second, and the second to the third. On the other hand, where A and B portions of a course are listed separately (for example, Economics 160A and 160B), the A course is *not* a prerequisite to B, unless it is specifically mentioned in the list of prerequisites.

PREREQUISITES

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

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 Academic Information section for enrollment procedures) include:

- **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.

California Articulation Number (CAN) System. UC Davis participates in the CAN System. This system uses a common number to identify some of the transferable, lower division, introductory courses commonly taught within each academic discipline on California college campuses. The system assures students that CAN courses on one participating campus will be accepted "in lieu of" the comparable CAN courses on another participating campus. For example: CAN Economics 2 on one campus will be accepted for CAN Economics 2 on another participating campus. Each campus, however, retains its own numbering system.

In this catalog, the CAN designator is found at the end of the course description of each approved CAN course (e.g. CAN Anth 2, CAN Econ 1A).

For additional information contact the Relations with Schools/EOP Outreach Office, (916) 752-1099.

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

**Davis is a
breath of
fresh air—
literally
and
figuratively—
in
comparison
to big city
schools.**

Law student



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 Academic Information section 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 can also be upper division courses (see under Lower Division Courses). Such courses would read, e.g., 105AT, 119AT, 141AT.

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

GRADUATE COURSES

Courses **numbered 200-299** are open to 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 AND NURSE PRACTITIONERS

Courses **numbered 300-399** are (1) 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. (2) Also included are courses for certification of family nurse practitioners and physician assistants. These courses are open only to students enrolled in those programs.



This is a great school! Thanks for the opportunity to say so.

Medical student

OTHER PROFESSIONAL COURSES

Courses **numbered 400-499** are professional training courses. 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 the dagger (†) 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.

KEY TO FOOTNOTE SYMBOLS

The following symbols are used throughout the Majors and Courses section to indicate:

*Not to be given 1988/89

†Approved for graduate degree credit

¹Absent on leave, 1988/89

²Absent on leave, Fall Quarter 1988 (Semester, for Law School)

³Absent on leave, Winter Quarter 1989

⁴Absent on leave, Spring Quarter 1989 (Semester, for Law School)

⁵In residence at President's Office (University Administration)

⁶In 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.

Afro-American Studies

(College of Letters and Science)

Jacquelyn Mitchell, Ed.D., Program Director
Program Office, 467 Kerr Hall (752-1548)

Committee in Charge

Richard T. Curley, Ph.D. (*Anthropology*)
Carl C. Jorgensen, Ph.D. (*Sociology*)
E. Dean MacCannell, Ph.D. (*Applied Behavioral Sciences*)

Jacquelyn Mitchell, Ed.D. (*Afro-American Studies*)

Jessie Mulira, Ph.D. (*Afro-American Studies*)
Marc Pilisuk, Ph.D. (*Applied Behavioral Sciences*)

Edward Thompson III, Ph.D. (*Afro-American Studies*)

Clarence E. Walker, Ph.D. (*History*), Chairperson
David Scofield Wilson, Ph.D. (*American Studies*)

Faculty

Jacquelyn Mitchell, Ed.D., Assistant Professor
Jessie Mulira, Ph.D., Lecturer
Edward Thompson III, Ph.D., Assistant Professor

The Major Program

The Afro-American Studies Program provides 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 the Program are disproportionately concerned with Afro-America, affiliated courses offered by instructors formally housed in other departments throughout the University broaden students' access to courses on Africa, Afro-America, and other Black experiences throughout the diaspora. Students who choose 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 in any discipline requiring a broad social science 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 Adviser. J. Mitchell.

Minor Program Requirements:

	UNITS
Afro-American Studies	24
Select one course from Afro-American Studies 10, 15, or 80	4
Select five courses from Afro-American Studies 100, 101, 107, 110, 120, 121, 123, 133, 145A, 145B, 150A, or 150B	20

American History and Institutions. This University requirement can be satisfied by completion of Afro-American Studies 10, 100, 120, 121. (See also under University requirements.)

Courses in Afro-American Studies

Lower Division Courses

10. Introduction to Afro-American Culture and Society (4) I, Mitchell
Lecture—4 hours. Introduction to the contemporary Black American experience by critically examining historical, political and social and economic factors that have affected the development and status of Afro-American people.

15. Introduction to Afro-American Humanities (4) II. Mulira
Lecture—4 hours. Introduction to Afro-American cultural tradition as it evolved from West Africa to the Caribbean, South America and North America via slavery. Offered in odd-numbered years.

80. Introduction to Black Politics (4) I, Thompson
Lecture—4 hours. Introduction to the analysis of Afro-American politics, using conceptual frameworks from political science and other social sciences.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Survey of Ethnicity in the U.S. (4) II. Mitchell
Lecture—4 hours. The history, culture, philosophy, and current problems of groups considered ethnic minorities in the United States as viewed by the groups themselves. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2 or Sociology 2.

101. Introduction to Research in the Afro-American Community (4) II. Thompson
Lecture—4 hours. Prerequisite: course 10 or consent of instructor. Introductory survey of Afro-American Studies methods and techniques; problems and methodology in Afro-American Studies.

***107. African Cultural Heritage in the Americas (4) III. The Staff**
Lecture—4 hours. Prerequisite: course 110 or consent of instructor. Analysis of African cultural systems as they adapted to the slave regimes in the antebellum and their retentive mechanisms in the postbellum Americas.

***110. West African Social Organization (4) I. Mulira**
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. Thompson**
Lecture—4 hours. Prerequisite: course 10 or consent of instructor. Ecology, social organization, and survival culture of Afro-America. Historical and comparative study of Afro-American populations in relation to other groups.

121. Afro-America: Post-Emancipation (4) III. Thompson
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) III. Mitchell**
Lecture—4 hours. Prerequisite: upper division standing or consent of instructor. Analysis of social science research to examine relationship between Black family structures, patterns of functioning, and political, economic and social conditions. Examination of role differentiation within families by race and social class. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2. Offered in odd-numbered years.

145A. Black Social and Political Thought (4) III. Thompson
Lecture—4 hours. Prerequisite: course 10 or 80, or consent of instructor. Exploration and analysis of Black social and political thought in the Americas.

***145B. Black Intellectuals (4) III. Thompson**
Lecture—4 hours. Prerequisite: course 10, 80, 145A, or consent of instructor. Exposition and critical analysis of selected theoretical writings of Black intellectuals, and especially political and social thinkers, in the Americas.

***150A. The Afro-American Visual Arts Tradition: A Historical and Cultural Study (4) II. 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) I. 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. May be repeated for credit for a total of 6 units. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

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 comprehensive courses are acceptable.)

	UNITS
Social Sciences and Humanities	39-40
Written and oral expression (see College requirement)	8
Cultural anthropology or geography (Anthropology 2 or Geography 2)	3-4
Philosophy of biological sciences (Philosophy 10G or 10H)	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)	18
Biochemistry (Biochemistry 101A, 101B) and/or upper division plant or animal physiology	6
Mathematics (Mathematics 16A plus either Mathematics 16B, Computer Science Engineering 10, Agricultural Science and Management 150, Engineering 5, or Statistics 13)	6-7
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

†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 "agri-business" would have obvious choices based on geographical interests.

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) 4-5
 Agrarian themes in literature (English 174 or the equivalent) 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 25-28
 Total Units for the Major 180

Major Adviser. R. J. Romani (*Pomology*).

Courses in Agrarian Studies

Questions pertaining to the following courses should be directed to the instructor or to the Pomology Department, 1035 Wickson Hall.

Lower Division Course

2. Perspectives on Agriculture (4) II. Romani
 Lecture—3 hours; discussion—1 hour (alternate weeks); one all-day field trip. Prerequisite: introductory course in the chemical or biological sciences recommended. Introduction to agrarian studies, exploring agriculture's vital role in past civilizations and in current societies. A review of important connections between agriculture and the natural and social sciences. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Botany 10.

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.

degrees. Detailed information regarding graduate study may be obtained by writing the Group Chairperson.

Graduate Advisers. W.W. Winterlin and T. Shibamoto (*Environmental Toxicology*), D.S. Reid and T. Richardson (*Food Science and Technology*), R.S. Criddle (*Biochemistry and Biophysics*), S.H. Zeronian (*Textiles and Clothing*), V.L. Singleton (*Viticulture and Enology*).

Related Courses. See Biochemistry 205; Environmental Toxicology 203, 220, 220L; Food Science and Technology 201, 202, 211, 250, 250L; 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.)

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. An undergraduate program leading to a bachelor of science degree is offered in Agricultural Education. For graduate study refer to the Graduate Division section in this catalog.

Teaching Credential Subject Representative. Secondary Teaching Credentials: Agriculture—J.G. Leising (137 Academic Office Building-4); Home Economics—B.G. Goldman (149 Academic Office Building-4). Community College Credentials: Agriculture—J.G. Leising (137 Academic Office Building-4).

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, Advising Center, 101 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. Pershing, Goldman; II. Leising, Varrella
 Lecture—2 hours; field observations. Prerequisite: upper division standing. 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. 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. Pershing
 Lecture—2 hours; laboratory—3 hours. Prerequisite: 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: Agricultural 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.

190. Seminar in Agricultural Education (2) I, II, III. The Staff
 Seminar—2 hours. Discussion of selected critical issues in agricultural education. May be repeated for credit with consent of instructor. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
 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, Goldman, Pershing; III, Leising, Varrella
 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) III. Leising
 Lecture—3 hours. Prerequisite: course 100; course 300 (may be taken concurrently). Major paradigms in program planning and development. Emphasis on key steps in curriculum development, including selection and organization of educational objectives, learning experiences and teaching materials and resources. (Sect. 1, Agriculture; Sect. 2, Home Economics.) (P/NP grading only.)

302. Teaching Methods in Education (3) III. Goldman, Leising
 Lecture—1 hour; discussion—2 hours. Prerequisite: courses 100, 300 and 301. Development of teaching strategies, with special emphasis on the designing of learning experiences, instructional execution, teaching aids. (Sect. 1, Agriculture; Sect. 2, Home Economics.)

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

Agricultural and Environmental Chemistry (A Graduate Group)

David S. Reid, Ph.D., Chairperson of the Group
 Group Office, 1480 Chemistry Annex
 (752-1415)

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.

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) III. Pershing

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

The major in Agricultural and Managerial Economics is designed for students planning careers or graduate study in the field of applied economics. Preparatory courses are intended to equip students for upper division coursework, while breadth subject matter gives them the opportunity to broaden their academic horizons. Depth subject matter provides an analytical framework and tools suitable for analysis of the economic behavior of consumers, firms, and markets. Options within the major permit students detailed examination of areas of interest, with emphasis on theoretical and quantitative analysis.

Each student must specialize in at least one of three options: Agricultural Economics, which focuses on topics related to the production and marketing of foods and fibers; Consumer Economics, which focuses on issues related to consumer decision-making, protection, and welfare; or Managerial Economics, which focuses on topics related to evaluating, financing, and managing business activities.

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	45-47
Written and oral expression (see College requirement)	7-8
Additional English, English 1, 3, 20, 102, or 103	3-4
Economic principles (Economics 1A-1B)	10
Accounting (Economics 11A-11B)	8
Statistics (Statistics 13, 103)	8
Mathematics (Mathematics 16A-16B)	6
Computer science, (Agricultural Science and Management 21, Computer Science Engineering 10, or 30)	3-4
Depth Subject Matter †	47-53
Micro theory, Agricultural Economics 100A, 100B	8
Quant methods, Agricultural Economics 106, 155	8

†Students graduating with this major are required to attain at least a C average (2.0) in all upper division Agricultural Economics, Consumer Economics, and Economics courses, plus any other upper division courses taken at the University in the depth subject matter.

Macro theory, Economics 101 or 135

Options (choose at least one):

(a) Agricultural Economics

At least 15 units must be chosen from Agricultural Economics 120, 130, 131, 140, 145, 150, 180. The remaining 13 units must be selected from upper division courses in Agricultural Economics and/or Economics.

(b) Consumer Economics

At least 15 units must be chosen from Agricultural Economics 118A, 130, 141M, 142, 143, Consumer Science 100, 135. The remaining 17 units may be chosen from the aforementioned courses or from Agricultural Economics 120, Applied Behavioral Sciences 171, Economics 121A, 121B, 125A, 125B, 130, Environmental Studies 160, 168A, 168B, Environmental Toxicology 101, 128, 138, Political Science 100, 174.

(c) Managerial Economics

Agricultural Economics 18. At least 12 units must be chosen from Agricultural Economics 112, 118A, 118B, 136, 157, 171A, 171B, 180. The remaining 16 units may be chosen from the aforementioned courses or from Agricultural Economics 120, 130, 131, 140, 143, 145, 150, 190A, 190B, Economics 101, 121A, 121B, 135, 150A, 150B, 151A, 151B, 160A, 160B, Political Science 174, 188.

Breadth Subject Matter (see undergraduate handbook in Department Advising Office for complete list of courses)

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).

Unrestricted Electives

Total Units for the Major 180

Advising Center for the major is located in University House Annex (752-6185).

Major Adviser. S. H. Sosnick (*Agricultural Economics*).

Graduate Study. See the Graduate Division section in this catalog.

Agricultural Economics

(College of Agricultural and Environmental Sciences)

Harold O. Carter, Ph.D., Chairperson of the Department

Gordon A. King, Ph.D., Vice Chairperson of the Department

Department Office, 118 Voorhies Hall (752-1517)

Faculty

Richard T. Alcauskas, J.D., Lecturer
 Julian M. Alston, Ph.D., Assistant Professor
 Oscar R. Burt, Ph.D., Professor
 Bayford D. Butler, M.S., Lecturer
 Leslie J. Butler, Ph.D., Lecturer
 Michael R. Caputo, Ph.D., Assistant Professor
 Hoy F. Carman, Ph.D., Professor
 Colin A. Carter, Ph.D., Associate Professor
 Harold O. Carter, Ph.D., Professor
 Willard W. Cochrane, Ph.D., Adjunct Professor
 Roberta L. Cook, Ph.D., Lecturer
 James H. Cothern, Ph.D., Lecturer
 D. Barton DeLoach, Ph.D., Professor Emeritus
 Jerry Foytik, Ph.D., Professor Emeritus
 Benjamin C. French, Ph.D., Professor

Varden Fuller, Ph.D., Professor Emeritus
 Richard D. Green, Ph.D., Professor
 Arthur Havenner, Ph.D., Professor
 Thomas W. Hazlett, Ph.D., Assistant Professor
 Dale M. Heien, Ph.D., Associate Professor
 Gloria E. Helfand, Ph.D., Assistant Professor
 Richard E. Howitt, Ph.D., Professor
 Robert D. Innes, Ph.D., Assistant Professor
 Lovell S. Jarvis, Ph.D., Associate Professor
 Warren E. Johnston, Ph.D., Professor
 Desmond A. Jolly, Ph.D., Lecturer
 Gordon A. King, Ph.D., Professor
 Catherine L. Kling, Ph.D., Assistant Professor
 Sylvia Lane, Ph.D., Professor Emeritus
 Douglas M. Larson, Ph.D., Assistant Professor
 Elmer W. Learn, Ph.D., Professor
 Samuel H. Logan, Ph.D., Professor
 John B. Loomis, Ph.D., Assistant Professor
 (*Agricultural Economics, Environmental Studies*)

Marc S. Mangel, Ph.D., Adjunct Professor
 (*Agricultural Economics, Mathematics*)

Philip L. Martin, Ph.D., Professor
 Alexander F. McCalla, Ph.D., Professor
 Chester O. McCorkle, Jr., Ph.D., Professor
 Quirino Paris, Ph.D., Professor
 Refugio I. Rochin, Ph.D., Associate Professor
 Richard J. Sexton, Ph.D., Assistant Professor
 Lawrence E. Shepard, Ph.D., Professor
 J. Herbert Snyder, Ph.D., Professor Emeritus
 Stephen H. Sosnick, Ph.D., Professor
 Joe J. Stasulat, Ph.D., Lecturer
 J. Edward Taylor, Ph.D., Assistant Professor
 James E. Wilen, Ph.D., Professor (*Agricultural Economics, Environmental Studies*)

Major Program and Graduate Study. See the major in Agricultural and Managerial Economics; and for graduate study, see the Graduate Division section in this catalog.

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) III. Learn 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. Alcauskas; summer, — 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. (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, Sexton; II, Carman, III, Helfand Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A, 1B; Mathematics 16B. Theory of individual consumer and market demand; theory of production and supply of agricultural products, with particular reference to the individual firm; pricing, output determination, and employment

of resources under pure competition. (Not open for credit to students who have completed Economics 100 or the equivalent; however, Economics 100 will not serve as prerequisite to course 100B.)

100B. Intermediate Microeconomics: Imperfect Competition, Markets and Welfare Economics (4) I, Martin; II, Larson; III, Hazlett

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, Taylor; II, King; III, Larson

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A, Statistics 103. Statistical methods for analyzing quantitative agricultural economics data: linear and multiple correlation and regression analysis.

112. Fundamentals of Business Organization (4) I, III. The Staff

Lecture—2 hours; discussion—2 hours. Prerequisite: upper division standing or consent of instructor. The role of organizational design and behavior in business and public agencies. Principles of planning, decision making; individual behavior, motivation, leadership; informal groups; conflict and change in the organization.

113. Fundamentals of Marketing Management (4) II. Staff

Lecture—4 hours. Prerequisite: Economics 1A. For non-majors only. Nature of product marketing by the business firm. Customer-product relationships, pricing and demand; new product development and marketing strategy; promotion and advertising; product life cycles; the distribution system; manufacturing, wholesaling, retailing. Government regulation and restraints. (Not open for credit to students who have completed course 136.)

118A-118B. Tax Accounting (3-3) II-III. Sosnick

Lecture—2 hours; discussion—1 hour. Prerequisite: Economics 11B. Determination of the federal income tax of employees, proprietors, partners, and corporations and the tax implications of alternative business decisions and methods of accounting.

120. Agricultural Policy (4) I. Leam

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A. Analytical treatment of historical and current economic problems and governmental policies influencing American agriculture. Uses of economic theory to develop historical and conceptual understanding of the economics of agriculture; how public policy influences the nature and performance of American agriculture. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Economics 1A-1B.

130. Agricultural Marketing (4) I, C. Carter; II, Carman

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.

131. Agricultural Markets, Prices and Trade (3) III. French

Lecture—3 hours. Prerequisite: course 100B; course 130 recommended. Analysis of economic interdependencies among industries, geographically dispersed markets, alternative product forms and markets separated in time.

136. Managerial Marketing (4) II. The Staff

Lecture—4 hours. Prerequisite: course 100A and Statistics 103. Application of economic theory and statistics in the study of marketing. Marketing measurement and forecasting, market planning, market segmentation, determination of optimal product market mix, sales and cost analysis, conduct of marketing research, marketing models and systems.

140. Farm Management (5) III. H. Carter

Lecture—5 hours. Prerequisite: Economics 1A. Farm organization and resources; economic and technological principles in decision making; analytical techniques and management control; problems in organizing and managing the farm business.

141. Consumers and the Market (4) II. Hazlett

Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. Structure of the market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers. (Students who have had or are taking course 100A, Economics 100, or the equivalent may receive only 3 units of credit, so must enroll for course 141M.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: non-GE introductory course sequence Economics 1A-1B.

141M. Consumers and the Market (3) II. Hazlett

Lecture—4 hours. Prerequisite: Economics 1A. Factors affecting consumer expenditures. Structure of the market and the effects of its performance on consumers. Agencies aiding and protecting consumers, sources of information available to consumers. (Students who have had or are taking course

100A, Economics 100, or the equivalent must enroll for this 3-unit course instead of course 141.)

142. Personal Finance (3) I, 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. The Staff

Lecture—3 hours. Prerequisite: Agricultural Economics/Consumer Economics 142 or consent of instructor. Survey of investment institutions, sources of investment information, and portfolio theory. Analysis of the stock, bond and real estate markets from the perspective of the investor.

145. Farm and Rural Resources Appraisal (4) II. The Staff

Lecture—3 hours; laboratory—3 hours; field trip. Principles of farm and ranch appraisal; land utilization in relation to problems of development and valuation. Real estate instruments and elements of real estate finance.

147. Natural Resource Economics (4) II. Helfand

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A; enrollment open to non-majors only. Natural resource use problems with emphasis on past and current policies and institutions affecting resource use; determinants, principles, and patterns of natural resource use; property rights; conservation; private and public resource use problems; and public 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) II. Helfand

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A; enrollment open to non-majors only. Natural resource use problems with emphasis on past and current policies and institutions affecting resource use; determinants, principles, and patterns of natural resource use; property rights; conservation; private and public resource use problems; and public issues. (Students who have had or are taking course 100A, Economics 100, or the equivalent, must enroll in this course (for 2 units) rather than course 147.)

148. Economic Planning for Regional and Resource Development (3) II. 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 (4) I. Martin

Lecture—3 hours; discussion—1 hour. Importance of family and hired labor in agriculture; farm labor market; unions and collective bargaining in California agriculture; simulated collective bargaining exercise; effects of unions on farm wages and earnings.

155. Quantitative Analysis for Business Decisions (4) I, Caputo; II, Howitt; III, Green

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100A and 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** (4) II. Wilen

Lecture—3 hours; discussion—1 hour. Prerequisite: course 100B or the equivalent; introductory course in calculus recommended. Economic concepts necessary to study energy issues. Topics 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 (4) I. The Staff

Lecture—3 hours; discussion—1 hour. 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, and financial problem solving using a computer spreadsheet program. (Students who have had or are taking Economics 134 may not receive credit for this course.)

171B. Financial Management of the Firm (4) II. Innes

Lecture—3 hours; discussion—1 hour. Prerequisite: course 171A. Financial analysis at the firm level: methods of capital budgeting; calculating the cost of capital; dividend policies; mergers and acquisitions; and special current topics in finance.

176. Economic Analysis in Resource Use (3) III. Kling

Lecture—3 hours. Prerequisite: course 100A. 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. Agricultural Production Economics (4) II. Burt

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 106, 155; senior standing. Application of theory and quantitative methods to risk and uncertainty as they relate to production response, investment decisions, enterprise combination, machine scheduling, crop insurance and government programs.

***190A. Senior Research Project** (2) II.

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) III.

Lecture—1 hour; discussion—1 hour. Prerequisite: course 190A or consent of instructor. The research report begun in course 190A will be completed and, after evaluation by the instructor, be revised and resubmitted by the student prior to the end of 190B. (Deferred grading only, pending completion of sequence.)

192. Internship (1-6) I, II, III, summer. The Staff (Chairperson in charge)

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: consent of instructor. (P/NP grading only.)

Graduate Courses

200A. Microeconomic Theory (5) II. Innes

Lecture—4 hours; discussion—1 hour. Prerequisite: Agricultural Economics/Economics 200M. 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. Helms (Economics)

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) III. Makowski (Economics)

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. Roemer (Economics)

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.)

215A. Economic Development (4) I. Jarvis

Discussion—1 hour; seminar—3 hours. Prerequisite: Bachelor's degree in Economics (or the equivalent) or consent of instructor. Theories of economic development as they relate to developing nations; demographic problems; distribution issues in economic development. (Same course as Economics 215A.)

215B. Macroeconomic Development (4) II. Kaneda (Economics)

Discussion—1 hour; seminar—3 hours. Prerequisite: course 215A. The macroeconomics of economic development; monetary policy problems; fiscal problems, international trade; specific country studies. (Same course as Economics 215B.)

215C. Economic Development in Agriculture: Policy and Planning (4) II. Taylor.

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 Economics 215C.)

215D. Development Programming (4) III. Kaneda (Economics) Lecture—3 hours; discussion—1 hour. Prerequisite: courses 200B, 215A and 215B. Analysis of development plans, sectoral or regional programs and policies. Application of macroeconomic models, input-output, Social Account Matrix (SAM) and programming techniques. Analysis and case studies of methods of project evaluation. (Same course as Economics 215D.)

220. Economics of Consumer Policy (3) III. Hazlett

Lecture—3 hours. Prerequisite: one graduate course in economic theory and one course in econometrics or the equivalent. Policy criteria; sources of market failure; consumer policy alternatives; empirical evaluation of selected economic policies.

221. Agricultural Policy in Developed Countries (3) I. McCalla

Lecture—3 hours. Economic policy, its nature, formation and analysis; characteristics of agricultural sectors in developed countries; comparative analysis of policies relating to production, marketing, price, income, rural poverty, and resource adjustment; international trade policies for temperate zone agricultural commodities.

222. International Agricultural Trade and Policy (3) I. C. Carter

Lecture—3 hours. Prerequisite: course 100B or Economics 204, Economics 160A or the equivalent or consent of instructor. Analysis of country interdependence through world agricultural markets. Partial equilibrium analysis is used to study the impacts of national intervention on world markets, national policy choice in an open economy and multinational policy issues. Offered in even-numbered years.

240A. Econometric Methods (4) III. Burt

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. 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 Economics 240C.)

252. Applied Linear Programming (4) I. Howitt

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. Caputo

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. Green

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. Alston

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.

***258. Applied Consumption Analysis (3) III.** _____

Lecture—3 hours. Prerequisite: one graduate course in microeconomic theory. Advanced analysis of individual and aggregate consumption models; empirical determinants of consumer behavior; application of consumption economics to selected issues.

261. Case Problems in Management (3) II. 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, Johnston

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.

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.

276. Institutional and Economic Analysis of Natural Resources (3) I. Kling

Lecture—2 hours; discussion—1 hour. Prerequisite: course 100A or Economics 100. Natural resources are developed and allocated in a milieu of institutional arrangements that significantly affect their economic yields: definition/enforcement of property rights; information and search costs; market externalities, transactions and adjustment costs. Applications to land/water policy.

280. Analysis of Research in Production Economics (4) I. Paris

Lecture—3 hours; discussion—1 hour. Current problems and methods of analysis in agricultural production economics research. Emphasizes both firm and industry.

281. Economic Analysis of Demand and Trade (3) I. Sexton

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. Wilen

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. Johnston

Seminar—1 hour. Prerequisite: graduate standing in Agricultural Economics. Seminar to familiarize entering students with research issues, research applications, research methodology, information sources and problem identification. Focus is on underlying motivations, usefulness and scope of agricultural economics research. (S/U grading only.)

291. Advanced Research Development (1) I. French

Seminar—1 hour. Prerequisite: second-year Ph.D. standing. Current research problems and activities; guidance on the selection, design, funding and manageability of projects. (S/U grading only.)

293A-293B-293C-293D. Agricultural Economics Workshop (1-1-1-1) I-II-III; (D) III.

Seminar—1 hour. Prerequisite: second-year Ph.D. candidate standing. Workshop forum to develop student research proposals and to critique both student and faculty 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; 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	59-63
Biological Sciences	17-19
Biological Sciences 1; Genetics 10 or 100; choose two from Botany 2, Zoology 2, Microbiology 2-3, Physiology 110.	
Chemistry 1A-1B, and 8A-8B or 128A-128B	16
Mathematics and statistics, Mathematics 16A or 21A, and Agricultural Science and Management 150 or Statistics 13	7-8
Computer Science, Agricultural Science and Management 21	3
English 1 or 3 and 102 or 103. Rhetoric and Communication 1 or 3.	11-12
Economics 1A or 1B.	5
Depth Subject Matter	43-51
Education, Agricultural and Home Economics Education 100 and 300 or Applied Behavioral Sciences 175; Education 110	8
Animal Science 2, 41, 41L; and 21, 15 or 49A, and 49B or 49C	11-16
(Animal Science 1 required if student has no previous coursework in animal science.)	
Agricultural Economics 130 or 140	4-5
Plant science, Plant Science 2; Soil Science 10 or 100; choose one from Environmental Horticulture 10, Vegetable Crops 101, Agronomy 100, Pomology 101, Viticulture and Enology 100, 116A	11-13
Agricultural mechanics, Agricultural Practices 49, 149, Consumer Technology 15, 18; choose	

one from Agricultural Engineering
Technology 15, Civil Engineering 10 or
Consumer Technology 101 10

Specialization 30-32
(To be developed in consultation with
faculty adviser.)

Unrestricted Electives† 34-47
(To include General Education
requirement.)

Total Units for the Major 180

Major Adviser. J. G. Leising (*Applied Behavioral Sciences*).

Advising Center for the major is located in 101 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 the Teacher Education Program.

Graduate Study. The Department of Applied Behavioral Sciences offers a program of study leading to the M.Ed. degree. Further information may be obtained from the Department and the *Graduate Announcement*.

Graduate Adviser. J. Grieshop (*Applied Behavioral Sciences*).

Courses. For related courses see Agricultural and Home Economics Education, and Applied Behavioral Sciences.

R. Paul Singh, Ph.D., Professor
Henry E. Studer, M.S., Professor
Shrinivasa K. Upadhyaya, Ph.D., Associate
Professor

Wesley W. Wallender, Ph.D., Assistant Professor
Wesley E. Yates, M.S., Professor Emeritus

Courses. Courses are listed under Agricultural Engineering Technology (below), Consumer Technology, and Engineering: Agricultural.

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; for graduate study see the Graduate Division section in this catalog.

Courses in Agricultural Engineering Technology

These courses are intended primarily for students not majoring in Engineering. Majors in Engineering should refer to courses in Engineering: Agricultural. 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 (Studer in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Studer in charge)
(P/NP grading only.)

Upper Division Courses

101AT. Fruit Production Mechanization (1) I, II, III. Studer
Autotutorial. Prerequisite: Physics 1A or 6A; course 105 (may be taken concurrently). Orchard, vineyard and small fruit production machinery. Functions, capabilities and operating principles. (P/NP grading only.)

102AT. Farm Tractors (1) I, II, III. Chancellor
Autotutorial. Prerequisite: Physics 1A or 6A; course 105 (may be taken concurrently). Types of farm tractors, operating principles, power transmission components, power-take-off drives, implement hitches and controls, traction and drawbar power, operator safety, comfort and convenience. (P/NP grading only.)

103. Hydraulic Power and Controls (1) II. Studer
Lecture-laboratory—2 hours. Prerequisite: upper division standing; Physics 6A (or former 2A). Principles of operation and construction of hydraulic systems. Function and application of pumps, motors, and valves for controlling machines.

104AT. Field Machinery (1) I, II, III. J. Rumsey
Autotutorial. Prerequisite: Physics 1A or 6A; course 105 (may be taken concurrently). Performance, operating characteristics, costs, operating principals, components, use, types and sizes of farm equipment for field and row crops. (P/NP grading only.)

105. Farm Equipment Management (1) I, II, III. Chancellor
Lecture-discussion—1 hour. Prerequisite: Agricultural Practices 49, or concurrent enrollment in one of the following: course 101AT, 102AT, 104AT, Agricultural Practices 49; or consent of instructor. Farm machinery performance, selection, scheduling and maintenance as affected by technical features,

costs and operator abilities, as well as by crop, soil and weather characteristics. Discussions link technical information from accompanying autotutorial or practice courses to management principles.

110L. Experiments in Food Engineering (1) II. Singh
Laboratory—3 hours. Prerequisite: Food Science and Technology 110B (may be taken concurrently). Use of temperature sensors; measurement of thermal conductivity and heat transfer coefficients; heat exchangers; transient heat transfer in foods; refrigeration, freezing, concentration and dehydration of foods. (P/NP grading only.)

113. Animal Environment and Shelters (1) I.
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. Greenhouse Environment and Equipment (1) I.
Lecture—2 hours (last five weeks of quarter). Prerequisite: Plant Science 2 or Botany 2. Study of shelters and equipment providing a suitable environment for plant growth; temperature and humidity regulation; energy conservation, lighting.

132. Management of Agricultural Wastes (1) II. Hills
Lecture—1 hour. Prerequisite: upper division standing; Physics 6B and Chemistry 1B recommended. Current methods of disposing of animal, plant, pesticide, food processing, and forest products wastes. Waste problems in relation to air, soil and water resources.

134. Pesticide Application Techniques (1) III. Giles
Lecture—1 hour. Prerequisite: upper division standing, Chemistry 1B, introductory course in environmental toxicology, and Physics 1A or 6A; 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, II, III. Chancellor
Autotutorial—1 hour. Prerequisite: course 141 or International Agricultural Development 141 (may be taken concurrently). Autotutorial (slide-tape) presentation of machinery, irrigation, and marine equipment technology applications, operation, and maintenance. (P/NP grading only.)

152. Alternative Energy Applications in Agriculture (2) II. Jenkins, T. Rumsey
Lecture—2 hours. Prerequisite: Chemistry 1B and Physics 6B 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. Piedrahita
Lecture—3 hours. Prerequisite: Biological Sciences I, Mathematics 16B, Chemistry 1B. Basic principles of water chemistry and water treatment processes as they relate to aquacultural systems.

161B. Fundamentals of Aquacultural Engineering (3) III. Piedrahita
Lecture—3 hours. Prerequisite: course 161A. Design of aquacultural systems: design methodology, principles of fluid mechanics, site selection and facility planning, management operations, computer modeling.

192. Internship in Agricultural Engineering Technology (1-5) I, II, III. The Staff (Studer 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 (Studer in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Studer in charge)
(P/NP grading only.)

Graduate Courses

233. Agricultural Chemical Application Technology (3) III.
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

Agricultural Engineering

(College of Agricultural and Environmental Sciences)

Henry E. Studer, M.S., Chairperson of the Department

Department Office, 2030 Bainer Hall (752-0102)

Faculty

Norman B. Akesson, M.S., Professor Emeritus
Roy Bainer, M.S., LL.D., Professor Emeritus
William J. Chancellor, Ph.D., Professor
Pictiaw (Paul) Chen, Ph.D., Professor
Michael J. Delwiche, Ph.D., Associate Professor
Roger E. Garrett, Ph.D., Professor
D. Ken Giles, Ph.D., Assistant Professor
John R. Goss, M.S., Professor
Mark E. Grismer, Ph.D., Assistant Professor
George F. Hanna, M.Ed., Lecturer Emeritus
Bruce Hartsough, Ph.D., Assistant Professor
S. Milton Henderson, M.S., Sc.D., Professor Emeritus

David J. Hills, Ph.D., Professor
Bryan M. Jenkins, Ph.D., Associate Professor
Robert A. Kepner, B.S., Professor Emeritus
Coby Lorenzen, Jr., M.S., Professor Emeritus
Michael J. McCarthy, Ph.D., Assistant Professor
R. Larry Merson, Ph.D., Professor
John A. Miles, Ph.D., Professor
Stanton R. Morrison, Ph.D., Professor Emeritus
Loren W. Neubauer, Ph.D., Professor Emeritus
Michael O'Brien, Ph.D., Professor Emeritus
Raul Piedrahita, Ph.D., Assistant Professor
James W. Rumsey, M.S., Assistant Professor
Thomas R. Rumsey, Ph.D., Associate 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.

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 (Studer in charge)

299. Research (1-12) I, II, III. The Staff (Studer in charge) (S/U grading only.)

Professional Course

317. Teaching Agricultural Mechanics (3) II. Garrett
Lecture—1 hour; laboratory—3 hours; term paper. Prerequisite: a course in physics, 6 units related to agricultural mechanics; enrolled in Agricultural Education Teacher Credential Program. Methods of teaching agricultural mechanics in secondary schools. Curriculum planning. Development of lesson plans and teaching aids. Review of subject matter. Safety-planning facilities including selection, arrangement and management of tools, equipment and teaching materials.

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 Course

49. Field Equipment Operation (2) III. Rumsey
Lecture—1 hour; laboratory—3 hours. Operation, adjustment and trouble shooting of farm tractors and field equipment. Principles of operation, equipment terminology and uses of tilling, cultivating, thinning and planting equipment. Typical cultural practices sequences. (P/NP grading only.)

Upper Division Course

149. Field Equipment Maintenance (2) II. Rumsey
Lecture—1 hour; laboratory—3 hours. Prerequisite: Consumer Technology 16 and 101 or consent of instructor. Trouble shooting and major repair of farm equipment. Intermediate welding to include hardfacing and inert gas welding. Class projects on maintenance, repair and fabrication. (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.

Preparatory Subject Matter UNITS
60-66

- General biological sciences (Biological Sciences 1, plus: for Animal Science and Range Science options, Zoology 2-2L and Animal Science 2; for Food Science option, two courses from Microbiology 2-3, Botany 2 or Zoology 2-2L; for Plant Science option, Botany 2) 10-19
- Physical sciences (Chemistry 1A, 1B, 8A, 8B, plus: for Food Science option, Physics 6A; for Plant Science option, Physics 1A, 1B) .. 16-22
- Mathematics (Mathematics 16A-16B and Agricultural Science and Management 150) ... 10
- Economics (Economics 1A, 1B, 11A, 11B) 18

Breadth Subject Matter

- English, two courses from English 1, 3, 20, and one from English 104, Comparative Literature 1, 2, 3, Philosophy 5, 10 and Rhetoric and Communication 1. 7

(Not more than 4 units advanced placement credit allowed toward degree.)

General Education requirement (see General Education section in this catalog)

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 118A, 118B, 145, 171A, 171B; business methods (Agricultural Economics 155, 157); and business organization (Agricultural Economics 18, 112) 9-12

Depth Subject Matter 50

Four options are offered, each with 50 units of courses. Students should 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 100, Animal Genetics 107 9
- Nutrition 115 4
- Physiology 110 5
- Animal science 20
- Animal Science 41, 41L; at least one course from Animal Science 113, 114, 115, 116, 140, 160; and the balance from Animal Genetics 108, Animal Science 104, 105, 113, 114, 116, 119, 123, 124, 128, 131, 133, 135, Microbiology 177-177L, Epidemiology and Preventive Medicine 111, Nutrition 122, 123, Physiology 121, 130, 149.

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
- Physics 6B 4
- Food science and technology 31
- 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 100-100L or 110 4-5
- Genetics 100 4
- Plant Pathology 120 4
- Plant Science 2 5
- Soil Science 100, 109 6

Water Science 110 3
Restricted electives 13-14

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.

Range Science option

- Range Science 100, 133, 145, 160, 170 16
- Animal Science 41, 41L, 128 7
- Agronomy 112 3
- Nutrition 115 4
- Botany 111A, 117 7
- Soil Science 100 4
- Resource Sciences 101 3
- Agricultural Economics 147 4
- Agricultural Science and Management 21 3

Unrestricted Electives to bring total to 180 units.

Total Units for the Major 180

Major Adviser. R. W. Touchberry (*Animal Science*).

Upon entering the major, students should contact the Advising Center for assignment of a faculty adviser with expertise in the selected option.

Advising Center for the major is located in 1149 Food and Agricultural Sciences Building (752-6118); and peer advising is in 1139 Food and Agricultural Sciences Building.

Graduate Study. Refer to the Graduate Division section in this catalog.

Courses in Agricultural Science and Management

Questions pertaining to the following courses should be directed to the instructor or to the Advising Center, 258 Hunt Hall.

Lower Division Course

21. Applications of Microcomputers for Agriculture (3) I, III. Paulson (Agronomy and Range Science)
Lecture—2 hours; laboratory-discussion—2 hours. Prerequisite: high school algebra. Concepts of computing in an agricultural context; applications of microcomputers using BASIC, spreadsheets, database management, word processing and communications.

Upper Division Courses

121. Computer Programming: FORTRAN (4) II. Paulson (Agronomy and Range Science)
Lecture—3 hours; laboratory—1 hour. Prerequisite: course 21 or the equivalent experience. Stresses the development of modular algorithms embodied in FORTRAN to solve quantitative agricultural problems.

150. Applied Statistics in Agricultural Sciences (4) I, Geng
Lecture—3 hours; discussion-laboratory—2 hours. Applications of statistical methods to the analysis and interpretation of research data in plant, animal, behavioral, food and nutritional sciences. Lectures cover basic concepts and statistical methods. Specialized laboratory sections cover procedures, data processing and interpretations.

Agronomy

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Agronomy and Range Science.

Major Program and Graduate Study. See the major in Plant Science or Range and Wildlands Science; and for graduate study see the Graduate Division section in this catalog.

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

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) III. Qualset
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. Offered in odd-numbered years.

113. Fiber, Oil and Sugar Crops in a Changing World (4) I, Rains
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. Offered in odd-numbered years.

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. Techniques for morphological analysis of crop plant growth.

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. Design, Analysis and Interpretation (3) II. Geng
Lecture—3 hours. Prerequisite: Agricultural Science and Management 150 or the equivalent. Planning and analysis of field and laboratory experiments with emphasis on concept and technique of designing experiments. Randomized factorial, incomplete block and response surface designs discussed together with appropriate methods of data analysis and interpretations.

205B. Design, Analysis and Interpretation (3) III. Williams
Lecture—3 hours. Prerequisite: Agricultural Science and Management 150 or the equivalent; Agricultural Science and Management 21 recommended. Planning and analysis of field and laboratory experiments with emphasis on use of multiple regression, multivariate analysis, and dynamic simulation techniques in the biological interpretation of results.

221. Advanced Plant Breeding (4) III. Teuber
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 205A, Genetics 105, and Plant Science 113. Philosophy, methods and problems in developing improved plant species. Topics include: inbreeding, heterosis, progeny testing, breeding methodology, index selection, germplasm conservation, and breeding for pest and stress resistance. Discussions focus on population improvement methods and crop ideotype.

222. Quantitative Genetics and Plant Improvement (4) II. The Staff
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. The Staff
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 100 or the equivalent. Structure and function of chromosomes. Dynamics of their evolution at the molecular and structural levels. Offered in odd-numbered years.

225. Plant Genetics (3) I. Gepts
Lecture—3 hours. Prerequisite: Genetics 100 or the equivalent. Factors affecting transmission of Mendelian traits in higher plants. Analysis of nuclear and organellar genomes; reproductive systems; segregation, recombination, and linkage of Mendelian traits; transposable elements; sporophyte or gametophyte; and environmentally induced heritable variation.

226. Manipulation of Plant Chromosomes (3) I. Dvorak
Lecture—3 hours. Prerequisite: Genetics 100 or the equivalent. 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.

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) II. Phillips
Lecture—2 hours; seminar—1 hour. Relationships between fundamental and applied N₂-fixation research in biochemistry, genetics, physiology, microbiology, and ecology with overall emphasis on increasing agronomic productivity. Offered odd-numbered years.

234. Physiology of Crop Growth and Development (3) I. Jernstedt
Lecture—3 hours. Prerequisite: Botany 111A-111B or the equivalent. Selected aspects of plant growth and development as they relate to crop productivity. Analysis of current literature on shoot and root growth and function, reproduction, senescence, hormonal and environmental controls of development.

290. Seminar in Crop Growth, Production and Utilization (1-2) I, Travis; II, Cassman
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, The Staff; III, Gepts
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 credit for a total of 5 units. Same course may not be tutored more than one time. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Agronomy and Range Science

(College of Agricultural and Environmental Sciences)

Donald A. Phillips, Ph.D., Chairperson of the Department

Department Office, 133 Hunt Hall (752-1703)

Faculty

Robert W. Allard, Ph.D., Professor Emeritus (*Agronomy and Range Science, Genetics*)
R. William Breidenbach, Ph.D., Lecturer
Ivan W. Buddenhagen, Ph.D., Professor
Kenneth G. Cassman, Ph.D., Assistant Professor
Beecher Crampton, M.S., Professor Emeritus
Montague W. Demment, Ph.D., Assistant Professor

Jan Dvorak, Ph.D., Professor
Shu Geng, Ph.D., Professor
Melvin R. George, Ph.D., Lecturer
Paul L. Gepts, Ph.D., Assistant Professor
James E. Hill, Ph.D., Lecturer
Ray C. Huffaker, Ph.D., Professor
Leland F. Jackson, Ph.D., Lecturer
Subodh K. Jain, Ph.D., Professor
Judith A. Jernstedt, Ph.D., Assistant Professor
Milton B. Jones, Ph.D., Lecturer
Burgess L. Kay, B.S., Lecturer
Thomas A. Kerby, Ph.D., 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., Professor
Duane S. Mikkelsen, Ph.D., Professor
Kenneth N. Paulson, Ph.D., Lecturer
Maurice L. Peterson, Ph.D., Professor Emeritus
Donald A. Phillips, Ph.D., Professor
Yesh P. Puri, Ph.D., Lecturer
Calvin O. Qualset, Ph.D., Professor
Charles A. Raguse, Ph.D., Professor
D. William Rains, Ph.D., Professor
Kevin Rice, Ph.D., Assistant Professor
J. Neil Rutger, Ph.D., Adjunct Professor
Charles W. Schaller, Ph.D., Professor Emeritus
Steven R. Temple, Ph.D., Lecturer
Larry R. Teuber, Ph.D., Associate Professor
Robert L. Travis, Ph.D., Professor
Carl L. Tucker, M.S., 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 the Agronomy, and the Range Science course listings.

American Studies

(College of Letters and Science)

David Scofield Wilson, Ph.D., Program Director

Program Office, 816 Sproul Hall (752-3377)

Committee in Charge

Nicole W. Biggart, Ph.D. (*Sociology*)
Vincent A. Crockenberg, Ph.D., (*Education*)
Daniel J. Crowley, Ph.D. (*Art, Anthropology*)

Jay Mechling, Ph.D. (*American Studies*)
 Michael Smith, Ph.D. (*History*)
 Robert Sommer, Ph.D. (*Psychology*),
 Chairperson
 David Van Leer, Ph.D., (*English*)
 Clarence E. Walker, Ph.D. (*History*)
 Deborah Weiner, Ph.D. (*Art History*)
 David Scofield Wilson, Ph.D. (*American Studies*)

Faculty

Jay Mechling, Ph.D., 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 field-work 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	20
American Studies 120, 140A, 140B, 190A-190B	20
Interpretive Skills core courses	12
(a) Fieldwork: American Studies 111 (Sacramento Valley Studies)	4
(b) Criticism: Verbal, choose one course from Comparative Literature 141 (literary theory and criticism), English 110A (introduction to principles of criticism), Rhetoric and Communication 120 (rhetorical criticism)	4
(c) Criticism: Visual, choose one course from Art 147 (theory and	4

criticism of photography), Art 148
 (theory and criticism of painting and
 sculpture), Rhetoric and
 Communication 143 (media
 criticism: broadcast)

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.

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	20
No more than 8 units of course 192 may be counted toward this total.	

Faculty Advisers. J. Mechling, D. S. Wilson.
Teaching Credential Subject Representative. J. Mechling. See also the Teacher Education Program.

Courses in American Studies

Lower Division Courses

- *1A. **Technology, Science and American Culture** (4) I, Mechling
 Lecture—2 hours; discussion—1 hour; short papers. 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.). General Education credit: Contemporary Societies/Introductory.
- *1B. **Religion in American Lives** (4) II. Wilson
 Lecture—2 hours; discussion—1 hour; tutorials and field exercises. Examines ways Americans have ordered their lives with religion; how latter-day churches, imported faiths, and Indian cultures differ or converge; attention to "civil religion" and mass-media evangelism; genres of religious experience, such as testimony, song, dance, ritual, meditation, vision, trance. General Education credit: Civilization and Culture/Introductory.
- 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) I, 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) I, 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, 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) III. The Staff
 Lecture—1 hour; discussion—1 hour. Practical introduction to multi-disciplinary techniques of gathering, organizing, and interpreting the data of American experience; exercises in participant observation, interviewing, above-ground archaeology, photographic anthropology, and in the application of these techniques to the study of a literate, post-industrial civilization.
- 45. **Introduction to American Studies** (4) I, III. Wilson, Mechling
 Lecture—2 hours; discussion—2 hours; evaluation of written reports and conferences with individual students. Prerequisite: a course from the course 1 sequence, or Anthropology 2, or Sociology 2. 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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2 or Sociology 2.

98. **Directed Group Study** (1-5) I, II, III. The Staff (Chairperson in Charge)
 Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. **Individual Study for Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge)
 (P/NP grading only.)

Upper Division Courses

101A-H. **Special Topics** (4) I, II, III. The Staff (Chairperson in charge)
 Seminar—3 hours, intensive reading, writing, and special projects. Interdisciplinary group study of special topics in American Culture Studies, designed for non-majors as well as majors. Content will vary according to the instructor and in accord with the following titles: (A) Popular Culture Studies; (B) Women's Studies; (C) Material Aspects of American Culture; (D) American National Character; (E) American Lives Through Autobiography; (F) The Interrelationship Between Arts and Ideas; (G) New Directions in American Culture Studies; (H) Problems in Cross-Cultural American Studies. May be repeated for credit in different subject area only.

*111. **Sacramento Valley Studies** (4) III. Wilson
 Lecture—2 hours; discussion—1 hour; fieldwork. Prerequisite: course 1 or 45 or Anthropology 2 recommended, or consent of instructor. A comparative study of the American cultures in the Sacramento River Valley, including their relationship to a shared biological, physical, social environment, their intercultural relations, and their relationships to the dominant American culture.

120. **American Folklore and Folklife** (4) III. Mechling
 Lecture—3 hours; fieldwork—1 hour. The theory and method of the study of American folk traditions, including oral lore, customs, music, and material folk culture (arts, crafts, architecture, costume, food). Emphasis upon the collection, classification, and analysis of California and urban folk traditions. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Sociology 2.

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 role of environment, stories, jokes, rituals, ceremonies, personal style, and play. The effects of cultural diversity upon corporate cultures, both from within and in contact with foreign corporations.

130. **American Popular Culture** (4) II. Mechling
 Lecture-discussion—3 hours; fieldwork and written reports. Prerequisite: course 1F or 45 or consent of instructor. American popular expression and experience as a cultural system, and the relationship between this system and elite and folk cultures. Exploration of theories and methods for discovering and interpreting patterns of meaning in American popular culture. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: course 45, Anthropology 2, or Sociology 2.

*140A. **American Studies and the Social Sciences** (4) II. Mechling
 Lecture-discussion—3 hours; term paper. Prerequisite: course 45. Exploration of convergent ways American Studies scholars use languages of the social sciences to explore American events, institutions, values, and meanings. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: American Studies 45.

140B. **American Studies and the Humanities** (4) II. Wilson
 Lecture-discussion—3 hours; term paper. Prerequisite: course 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) II-III. 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, below; and Human Anatomy (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., Professor
Dallas M. Hyde, Ph.D., Professor
Ralph L. Kitchell, D.V.M., Ph.D., Professor
Kent Pinkerton, Ph.D., Assistant Adjunct Professor
Charles G. Plopper, Ph.D., Professor
Judith A. St. George, Ph.D., Assistant Adjunct Professor
Susan M. Stover, D.V.M., Ph.D., Assistant Professor
Fern Tablin, V.M.D., Ph.D., Assistant Professor
William Thurlbeck, M.D., Adjunct Professor
Walter S. Tyler, D.V.M., Ph.D., Professor
Reen Wu, Ph.D., Associate Adjunct Professor

Courses in Anatomy

Upper Division Courses

100. Systemic Anatomy (2) I, Cardinet and staff
Lecture—2 hours. Prerequisite: course 100L (concurrently) and Zoology 2. Lectures emphasizing the typical anatomical systems of the dog, with comparison to other species.

100L. Systemic Anatomy Laboratory (2) I, Cardinet and staff
Laboratory—6 hours. Prerequisite: course 100 (concurrently) and Zoology 2. Dissections, demonstrations emphasizing the typical anatomical systems of the dog, with comparison to other species.

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. Advanced Anatomy of the Forelimb (3) I, Hyde
Lecture—12 hours total; discussion—6 two-hour sessions; laboratory—12 three-hour sessions. Prerequisite: graduate standing and consent of instructor; course 100. Gross and microscopic anatomy of the fore limb of the dog and horse.

Emphasis on structural basis of function, unique aspects of each species, and on preparing graduate students for teaching.

201B. Advanced Anatomy of the Head (1.5) II. Plopper
Lecture—5 hours total; discussion—4 two-hour sessions; laboratory—6 three-hour sessions. Prerequisite: graduate standing and consent of instructor; course 100. Detailed dissection of the head of the dog with comparison to the horse. Emphasis on structural basis of function, unique aspects of each species, and on preparing graduate students for teaching.

201C. Advanced Anatomy of the Hindlimb (2) II. Hyde
Lecture—5 hours total; discussion—5 two-hour sessions; laboratory—10 three-hour sessions. Prerequisite: graduate standing and consent of instructor; course 100. Detailed dissection comparing the hindlimb of the dog and the horse. Emphasis on structural basis of function, unique aspects of each species, and on preparing graduate students for teaching.

201D. Advanced Anatomy of the Thorax (1.5) III. Plopper
Lecture—4 hours total; discussion—5 two-hour sessions; laboratory—6 three-hour sessions. Prerequisite: graduate standing and consent of instructor; course 100. Gross and microscopic anatomy of the thorax and its contents of the dog and other domestic species. Emphasis on structural basis of function, unique aspects of each species, and on preparing graduate students for teaching.

201E. Advanced Anatomy of the Abdomen (2) III. Tyler
Lecture—6 hours total; discussion—7 two-hour sessions; laboratory—7 three-hour sessions. Prerequisite: graduate standing and consent of instructor; course 100. Gross and microscopic anatomy of the contents of the abdomen comparing the dog to other domesticated species. Emphasis on structural basis of function, unique aspects of each species, and on preparing graduate students for teaching.

201F. Advanced Anatomy of the Pelvis (3) II-III. Faulkin
Lecture—10 hours total; discussion—11 two-hour sessions; laboratory—9 three-hour sessions. Prerequisite: graduate standing and consent of instructor; course 100. Gross and microscopic anatomy of the contents of the pelvis of the dog with comparison to other domesticated species. Emphasis on structural basis of function, unique aspects of each species, and on preparing graduate students for teaching. (Deferred grading only, pending completion of two-quarter sequence.)

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 (Wu, Tablin in charge)
Lecture—2 hours; discussion—1 hour. Consideration of the principles and applications of modern morphological methods and their role in biomedical research. Examples of specific methods include stereology, computer analysis of images, scanning and transmission electron microscopy, histochemistry, autoradiography, rapid freezing, and vascular injections. Offered in 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.

221. Neurosciences of Domestic Animals (5) II. Kitchell
Lecture—33 hours total; discussion—8 two-hour sessions; laboratory—9 three-hour sessions. Prerequisite: graduate standing and consent of instructor. Integrated study of the central nervous system including gross and microscopic anatomy, neurophysiology and neurological examination of domestic animals.

283. Tumor Biology (3) I, Faulkin, Cardiff, Benjamini, Goldman, Manning, Thellen, 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.)

291. Topics in Biology of Respiratory System (1) I, II, III. Tyler, Hyde, Plopper, St. George, Wu, Pinkerton
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Topics concerning structure and function of respiratory system. Possible topics include: lung growth, pulmonary reaction to toxicants, pulmonary inflammation, lung metabolism, biology of lung cells, tracheobronchial ep-

ithelium, nasal cavity structure and function. May be repeated for credit. (S/U grading only.)

297. Advanced Group Study in Surgical Anatomy (2-4) I, II, III. The Staff
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.)

Anatomy (A Graduate Group)

Paul FitzGerald, Ph.D., Chairperson of the Group
Group Office, 1321 Haring Hall (752-1174)

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 generally considered only once a year, the second week of April.

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.C. Enders (*Human Anatomy*), L.J. Faulkin (*Anatomy*).

Anesthesiology

See Medicine, School of

Animal Behavior (A Graduate Group)

Hugh Dingle, Ph.D., Chairperson of the Group
Group Office, 148 Young Hall (Psychology)
(752-1880/1855)

Faculty. The Group includes faculty from eleven departments in three schools and colleges.

Graduate Study. The Ph.D. program in Animal Behavior is an interdepartmental program which trains students for teaching and research in a variety of areas including psychology, zoology, animal science, veterinary science, ecology, and wildlife biology. Students choose one of the three areas of spe-

cialization: (1) ethology and evolutionary bases of animal behavior, (2) physiological basis of animal behavior, and (3) behavior of domestic animals. All three specializations emphasize the adaptive and evolutionary bases of animal behavior. Resources available to students, in addition to various departmental facilities, include those of the California 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, entomology, 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 100 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 pre-dissertation research may be pursued under the guidance of any faculty member of the Group, not necessarily the student's major professor.

Breadth Requirement. The following core courses or the equivalent (22 to 24 units) are required of all students.

Systemic physiology: Physiology 110 or Zoology 142

Statistical analysis: one course from Psychology 206, 207, Statistics 106, or 110.

Scientific approaches to animal behavior research: Animal Behavior 201

Seminar in animal behavior: Animal Behavior 290

Ecology: Entomology 104, Environmental Studies 100, or Zoology 125

College teaching: Biological Sciences 310 or Psychology 390

Comparative psychology: Psychology 250

Specialization. In addition to the requirements listed above, students must also take courses in one of the three areas of specialization with substitution as approved by the adviser.

Graduate Adviser. P. S. Rodman (Anthropology).

Courses in Animal Behavior

Graduate Courses

201. Scientific Approaches to Animal Behavior Research (3) I, II. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Philosophical issues, goals, strategies and tools in field and laboratory research. May be repeated for credit when topics differ.

***220. Behavioral Aspects of Animal Domestication** (3) III. Price (Animal Science)
Lecture—3 hours. Prerequisite: graduate standing and a course in animal behavior, or consent of instructor. History of animal domestication, the role of natural and artificial selection in domestication, the influence of environment and experience on domestic animal behavior and human-animal interrelations. Offered in even-numbered years.

290. Seminar in Animal Behavior (1-3) III. Owings (Psychology) Seminar—1-3 hours. Prerequisite: consent of instructor. Selected topics in animal behavior. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor.

299. Research (1-12) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor. (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 the major in Genetics.

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, 1149 Food and Agricultural Sciences Building.

Upper Division Courses

107. Genetics and Animal Breeding (5) I, III. Gall, Medrano
Lecture—4 hours; laboratory—3 hours. Prerequisite: Genetics 100. Principles of quantitative genetics applied to improvement of livestock and poultry. Effects of mating systems and selection methods are emphasized with illustration from current breeding practices.

108. Methods in Quantitative Animal Breeding (3) II. Famula
Lecture—3 hours. Prerequisite: course 107. Methods and procedures in quantitative animal breeding, including: expected value, single and multiple trait selection index, restricted selection, embedded traits, categorical traits, and best linear unbiased prediction.

109. Introduction to Parameter Estimation (1) II. Famula
Lecture—1 hour. Prerequisite: course 107 or the equivalent; course 108 recommended. Procedures for estimation of repeatability, heritability, and genetic and environmental correlations. Concept of expected value, estimation of variance components and the simulation of biological data.

190. Proseminar in Horse Genetics (1) III. Famula
Seminar—1 hour. Prerequisite: course 107, Animal Science 115, or consent of instructor. Selected topics presented by students on recent advances in the genetics of the horse. (P/NP grading only.)

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—3 hours. Prerequisite: course 107 or the equivalent. Theoretical basis of quantitative genetics and the consequences of Mendelian inheritance. Concepts used to estimate quantitative genetic differences and basis for partitioning the phenotypic variance. Offered in odd-numbered years.

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. Touchberry (Animal Science)
Lecture—3 hours. Prerequisite: course 107 and Animal Science 205; courses 204 and 108 recommended. General methods for the estimation of components of variance and covariance and their application to the estimation of heritability, repeatability and genetic correlations are considered. Specific emphasis is given to procedures applicable to livestock populations under selection.

250. Animal Improvement in an International Context (4) III. Bradford
Lecture—3 hours; seminar—1 hour. Prerequisite: completion of at least one year of graduate study, including upper division or graduate courses in livestock production and animal breeding. Evaluation, utilization, conservation and exchange of animal germ plasm resources; exploitation of heterosis; improvement schemes in the absence of central data processing; population structure and rate of improvement; roles of governments; group breeding schemes; research needs. (S/U grading only.) Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. The Staff (Bradford in charge)
Prerequisite: consent of instructor. Lectures and discussions of advanced topics in animal genetics. (S/U grading only.)

299. Research in Animal Genetics (1-12) I, II, III. The Staff (Bradford in charge)
(S/U grading only.)

Animal Nutrition

See Nutrition

Animal Physiology

(College of Agricultural and Environmental Sciences)

Verne E. Mendel, Ph.D., Chairperson of the Department

Department Office, 196 Briggs Hall (752-0203)

Faculty

Marylynn S. Barkley, Ph.D., Associate Professor
James M. Boda, Ph.D., Professor Emeritus
Earl E. Carstens, Ph.D., Associate Professor
Harry W. Colvin, Jr., Ph.D., Professor
Perry T. Cupps, Ph.D., Professor Emeritus
(Animal Science)

Charles A. Fuller, Ph.D., Associate Professor
Jack M. Goldberg, Ph.D., Associate Professor
John M. Horowitz, Jr., Ph.D., Professor
Barbara A. Horwitz, Ph.D., Professor
Andrew T. Ishida, Ph.D., Assistant 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
Grace L. Rosenquist, Ph.D., Assistant Adjunct Professor

Robert P. Scobey, Ph.D., Professor (Neurology)
Arnold J. Sillman, Ph.D., Professor
Arthur H. Smith, Ph.D., Professor Emeritus
Linda R. Watkins, Ph.D., Lecturer
W. Jeffrey Weidner, Ph.D., Professor
Barry W. Wilson, Ph.D., Professor (Avian Sciences)

Charles M. Winget, Ph.D., Lecturer
Dorothy E. Woolley, Ph.D., Professor

Courses. See the course listing under Physiology (Animal).

Animal Science

(College of Agricultural and Environmental Sciences)

William N. Garrett, Ph.D., Chairperson of the Department

Department Office, 2223 Food and Agricultural Sciences Building (752-1250)

Faculty

Thomas E. Adams, Ph.D., Associate 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., Lecturer
 Patricia J. Berger, Ph.D., Assistant Professor
 G. Eric Bradford, Ph.D., Professor
 Dan L. Brown, Ph.D., Assistant Professor
 C. Christopher Calvert, Ph.D., Associate Professor
 Floyd D. Carroll, Ph.D., Professor Emeritus
 Ernest S. Chang, Ph.D., Associate Professor
 Wallis H. Clark, Jr., Ph.D., Professor
 Douglas E. Conklin, Ph.D., Lecturer
 Fred S. Conte, Ph.D., Lecturer
 Perry T. Cupps, Ph.D., Professor Emeritus
 Edward J. DePeters, Ph.D., Associate Professor
 Serge Doroshov, Ph.D., Professor
 James G. Fadel, Ph.D., Assistant Professor
 Thomas R. Famula, Ph.D., Associate Professor
 Graham A. E. Gall, Ph.D., Professor
 William N. Garrett, Ph.D., Professor
 Dennis Hedgecock, Ph.D., Lecturer
 Hubert Heitman, Jr., Ph.D., Professor Emeritus
 J.L. Hull, M.S., Lecturer
 Silas S. O. Hung, Ph.D., Assistant Professor
 Robert C. Laben, Ph.D., Professor Emeritus
 Yu-Bang Lee, Ph.D., Associate Professor
 Glen P. Lofgreen, Ph.D., Professor Emeritus
 Joan M. Macy, Ph.D., Associate Professor
 Juan F. Medrano, Ph.D., Assistant Professor
 Verne E. Mendel, Ph.D., Professor (*Animal Science, Animal Physiology*)
 James H. Meyer, Ph.D., Professor Emeritus, Chancellor Emeritus
 Gary P. Moberg, Ph.D., Professor
 James G. Morris, Ph.D., Professor
 Edward O. Price, Ph.D., Professor
 Wade C. Rollins, Ph.D., Professor Emeritus
 Janet F. Roser, Ph.D., Assistant Professor
 Robert W. Touchberry, Ph.D., Professor (*Sesnon Professor in Animal Science*)
 Dana B. Van Liew, M.S., 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 biological, 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:

	UNITS
Preparatory Subject Matter	53-54
General biological sciences: Biological Sciences 1, Zoology 2-2L, and either Microbiology 2-3 or Botany 2	15-16
Physical sciences: Chemistry 1A, 1B, 8A, 8B; and 10 units of mathematics (equivalent to Mathematics 16A-16B), including statistics	26
Animal Science 1, 2, 41, and 41L	12
Depth Subject Matter	58-62
Physiological Sciences 101A-101B (Biochemistry 101A-101B may be substituted with consent of adviser)	6-7
Genetics, Genetics 100, Animal Genetics 107	9
Nutrition, Nutrition 110, and 115 or 124 (124 for Aquaculture option)	8-9
Physiology, Physiology 110, and Wildlife and Fisheries Biology 121 (for Aquaculture option)	5-9
Laboratory, one course from Animal Science 135, Microbiology 177L, Biochemistry 101L, Clinical Pathology 102, Physiology 110L	2-6
Animal science (28 units minimum)	28
At least two courses from Animal Science 113, 114, 115, 116, 140, 160; and the balance from Animal Science 104, 105, 106, 114, 115, 116, 120, 120L, 123, 124, 128, 131, 133, 135, 140, 160; Microbiology 177, 177L, Animal Genetics 108, Physiology 121, 121L, 130, Nutrition 122, 122L, 123, 124	
OR Aquaculture option, one course from Animal Science 113, 114, 115, 116, 116, 140, 160;	
at least 12 units from Animal Science 104, 105, 106, 119, 120, 120L, 123, 124, 128, 131, 133, 135, Animal Genetics 106, 109, Nutrition 122, 122L, 123, 124, Physiology 121, 121L, 130, Agricultural Engineering Technology 161A, 161B;	
and at least 12 units from Zoology 100, 100L, 112-112L, 142, Wildlife and Fisheries Biology 120, Environmental Studies 151, 151L, Microbiology 177, 177L	
Breadth Subject Matter	20
Written and oral expression (see College requirement)	7
General Education requirement (see General Education section in this catalog)	
Additional social sciences and humanities	13
Unrestricted Electives	44-49
Faculty advisers assist students in selecting electives according to individual interests and objectives. Chemistry 1C, Physics 1A, 1B, and Zoology 100 are recommended for graduate study preparation and completion of course requirements for application to School of Veterinary Medicine.	

Total Units for the Major 180

Master Adviser. J.G. Morris.

Advising Center for the major is located in 1149 Food and Agricultural Sciences Building. Students must secure their academic adviser through this office upon entering the major.

Graduate Study. The Department of Animal Science offers a program of study and research leading to the M.S. degree. Detailed information may be obtained by contacting the graduate adviser. See also the Graduate Division section in this catalog.

Graduate Adviser. C.C. Calvert.

Courses in Animal Science

Lower Division Courses

1. Domestic Animals and People (4) I, Brown
 Lecture—3 hours; laboratory—3 hours. Animal domestication

and factors affecting their characteristics and distribution. Animal use for food, fiber, work, drugs, research and recreation; present and future roles in society. Laboratory exercises with beef and dairy cattle, poultry, sheep, swine, laboratory animals, fish, horses, meat and dairy products. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10.

2. Introductory Animal Science (4) III, Berger
 Lecture—3 hours; laboratory—3 hours. Prerequisite: course 1 and Biological Sciences 1 recommended. Growth, reproduction, lactation, inheritance, nutrition, and disease control in domesticated animals; species used in aquaculture; the application of sciences to animal production.

15. Introductory Horse Husbandry (3) II, Roser
 Lecture—3 hours. Prerequisite: course 2 recommended. Introduction to care and use of light horses emphasizing the basic principles for selection of horses, responsibilities of ownership, recreational use and raising of foals.

21. Livestock and Dairy Cattle Judging (2) III, Van Liew
 Laboratory—6 hours. Prerequisite: course 1 or 2 recommended. Evaluation of type as presently applied to light horses, meat animals and dairy cattle. Relationship between form and function, form and carcass quality and form and milk production.

22A-22B. Animal Judging (2-2) II-I, Van Liew
 Laboratory—6 hours; weekend field trips. Prerequisite: course 21 or the equivalent. Study of individual and group classes of animals with emphasis on visual appraisal of conformation and its accurate description. Course is required for intercollegiate judging competition. (P/NP grading only.)

41. Domestic Animal Production (2) I, DePeters
 Lecture—2 hours. Prerequisite: courses 1 and 2. Principles of farm animal management, including dairy and beef cattle, sheep, and swine. Industry trends, general husbandry, nutrition, and reproduction.

41L. Domestic Animal Production Laboratory (2) I, II, DePeters
 (in charge), Van Liew
 Laboratory—6 hours. Prerequisite: course 41 (may be taken concurrently). Animal production principles and practices, including field trips to dairy cattle, beef cattle, sheep and swine operations, and campus laboratories. (P/NP grading only.)

49A-49B-49C. Animal Management Practices (2-2-2) I-II-III, The Staff (Hull 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, dairy goats, horses, sheep, swine, and laboratory animals. (P/NP grading only.)

92. Internship in Animal Science (1-12) I, II, III, The Staff
 (Department Chairperson in charge)
 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. (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

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 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.

106. Domestic Animal Behavior Laboratory (2) II, Price
 Laboratory—6 hours. Prerequisite: course 104 or the equivalent. Research experience with the behavior of large domestic animals. Experimental design, methods of data collection and analysis, and reporting of experimental results.

113. Principles of Swine Production (4) I, Berger, Calvert, Parker
 Lecture—3 hours; laboratory—3 hours; one Saturday field trip. Prerequisite: Physiological Sciences 101B, Physiology 110, Genetics 100. Production of the various classes of swine as related to breeding, nutrition, metabolism, and reproduction.

- 114. Dairy Cattle Production** (4) III. DePeters
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 124, Animal Genetics 107, and Nutrition 115 or the equivalent background in lactation, animal breeding and nutrition. 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. Roser
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 15, Genetics 100; Nutrition 110 or 115; Physiology 110; or consent of instructor. 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. Beef Cattle and Sheep Production** (4) III. Bradford, Zinn
Lecture—3 hours; laboratory—3 hours; one or two Saturday field trips. Prerequisite: course 41, Animal Genetics 107, Nutrition 110 or 115, and Physiology 110; course 123 recommended. Application of principles of nutrition, physiology and genetics to development of efficient management practices for beef cattle and sheep production. Resources used: similarities and differences between the species affecting management practices; range and feedlot operations; improving carcass and meat quality.
- 118. Aquatic Animal Production** (4) III. Gall, Doroshov
Lecture—3 hours; discussion—1 hour. Prerequisite: course 131; Animal Genetics 107; Nutrition 124 (may be taken concurrently). Breeding, feeding and management of aquatic animals; application of basic principles of animal science to the conversion of animal feeds to human food; genetic, environmental and managerial sources of variation in production efficiency; emphasis on trout, catfish and oysters.
- 119. Experimental Aquaculture** (15) I, Chang, Clark
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; 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.) Offered in even-numbered years.
- 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. Ashmore, Lee, 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
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** (3) II. Fadel
Lecture—2 hours; laboratory—2 hours. Prerequisite: upper division standing; Nutrition 110, 115 or the equivalent; understanding of animal production, or consent of instructor. Linear programming in animal agriculture emphasizing farm planning and ration formulation. Provides experience in understanding, developing and applying linear programs.
- 131. Reproduction and Early Development in Aquatic Animals** (4) 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 110 or 115; 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** (3) III. Morris, Raguse (Agronomy and Range Science)
Lecture—3 hours. Prerequisite: course 2, Range Science 133. 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.)
- 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. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge.)
Prerequisite: consent of instructor. (P/NP grading only.)
- Graduate Courses**
- 205. Computer Analysis of Biological Data** (3) II. Famula
Lecture—3 hours. Prerequisite: Agricultural Science and Management 150. Use of matrix algebra, regression and least squares programs to manipulate and analyze balanced and unbalanced biological data. Lectures will be concerned with the analytical procedures used in the programs as well as interpretation of computer output.
- 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; physicochemical 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 in Large Animals: Models for Human Diseases** (3) II. Ashmore
Lecture—3 hours. Prerequisite: Biochemistry 101A-101B; Physiology 100A-100B (may be taken concurrently). In-depth survey of etiology and pathology hereditary disorder in large animals and their usefulness in research as models for analogous diseases in humans.
- 235. Advanced Techniques in Animal Nutrition Research** (2) I, II, III. The Staff (Calvert in charge)
Lecture—1 hour; laboratory—3 hours. Prerequisite: graduate standing and consent of instructor. Application of advanced laboratory techniques to animal nutrition research; use of mechanistic models for experimental design and data analysis; surgical preparations useful in nutrition research; review

of current literature. May be repeated for credit when topics differ. (S/U grading only.)

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Reports and discussions of topics of interest in genetics, nutrition, and physiology as they apply to animal science. (S/U grading only.)

290C. Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate standing. Weekly conference on research problems, progress and techniques in the animal sciences. May be repeated for credit. (S/U grading only.)

297. Supervised Teaching in Animal Science (2) I, II, III. The Staff (Chairperson in charge)
Supervised teaching—6 hours. Prerequisite: consent of instructor. Practical experience in teaching Animal Science at the University level; curriculum design and evaluation; preparation and presentation of material. Assistance in laboratories, discussion sections, and evaluation of student work. An evaluation letter sent to the Graduate Adviser with a copy to the student. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (Sect. 1, 2, 3—letter grading; from Sect. 4 on—S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Anthropology

(College of Letters and Science)

David G. Smith, Ph.D., Chairperson of the Department

Department Office, 330 Young Hall (752-0745/0746)

Faculty

- John M. Beaton, Ph.D., Assistant Professor
Robert L. Bettinger, Ph.D., Associate Professor
David J. Boyd, Ph.D., Associate Professor
Daniel J. Crowley, Ph.D., Professor
(*Anthropology, Art History*)
^{2,3}Richard T. Curley, Ph.D., Associate Professor
William G. Davis, Ph.D., Associate Professor
Jack D. Forbes, Ph.D., Professor (*Anthropology, Applied Behavioral Sciences*)
¹Sarah B. Hrdy, Ph.D., Professor
Suad Joseph, Ph.D., Associate Professor
²Henry M. McHenry, Ph.D., Professor
David L. Olmsted, Ph.D., Professor
Benjamin S. Orlove, Ph.D., Professor
(*Environmental Studies*)
Peter S. Rodman, Ph.D., Professor
Janet S. Shibamoto, Ph.D., Associate Professor
David G. Smith, Ph.D., Professor
^{3,4}Delbert L. True, Ph.D., Professor
Carolyn F. Wall, Ph.D., Associate Professor
Aram A. Yengoyan, Ph.D., Professor

The Major Program

Anthropology is a diverse field with many subdisciplines, subdivided at Davis into four categories—biological, social/cultural, linguistics, and archaeology. The student who majors in anthropology learns about the social, biological, and linguistic dimensions of human social life—past and present—and gains a broad understanding of humans and society that is unparalleled in other disciplines. The anthropology student learns to evaluate evidence, think critically and write clearly and, following graduation, may wish to pursue graduate studies in anthropology or in a related field such as social welfare, museum work, education, law, or international development.

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 and linguistic field methods), and archaeology (pre-history and the techniques

and methods of archaeology) should enroll in the Bachelor of Arts degree program.

Anthropology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-42
Anthropology 1, 2, 3, 4	16
Statistics 13	4
Geography 1 or Environmental Studies 30	4
Foreign language (15 units or the equivalent in one language)	0-18
Depth Subject Matter	40
Anthropology 110, 128, 137, 170	16
Anthropology, one course from 111, 112, 114, 117, 120	4
Biological anthropology, one course	4
Ethnography, one course	4
Archaeology, one additional course	4
An additional 8 units selected from the following: any upper division anthropology course, Art 150, 151, Genetics 100	8
Total Units for the Major	64-82

Anthropology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	46-57
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 (10 units or the equivalent in one language)	0-10
Depth Subject Matter	45
Six courses in anthropology, including at least 3 in biological anthropology, and the remaining 3 chosen in consultation with major adviser	23-24
Genetics 100 and 103	7
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	91-102

Recommended

Geology 1, 1L, 3, 3L; Physics 6A, 6B, 6C; Psychology 1, 15.

Bachelor of Science List of Courses

Physical anthropology, Anthropology 151, 152, 153, 154A, 154B, 155, 156, 157, 157L, 158.

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 100, 102A, 102B, 103, 104, 105, 106, 107; 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: R.T. Curley, J.S. Shibamoto, D.L. True; B.S. degree: H.M. McHenry, P.S. Rodman.

Minor Program Requirements:

Anthropology	UNITS
.....	19-24
General emphasis	22-24
One course from Anthropology 114, 117, 120	4
One course from Anthropology 151, 152, 153, 154A, 154B, 155, 156, 157, 157L, 158	2-5
One course from Anthropology 170, 171, 173, 174, 175	4
One course from Anthropology 140A, 140B, 141A, 141B, 141C, 142, 144, 145, 147, 148, 149, 176	4
One course from Anthropology 121, 122, 123, 124, 125, 126, 127, 128, 129, 133, 135, 137	4
One additional course from remaining upper division Anthropology courses	4

Biological emphasis

Anthropology 152, 153, 154A

Two additional upper division Anthropology courses chosen in consultation with B.S. degree undergraduate adviser

Social-Cultural emphasis

Anthropology 137

One course from Anthropology 140A, 140B, 141A, 141B, 141C, 142, 144, 145, 147, 148, 149, 176

Two courses from Anthropology 101, 114, 117, 120, 121, 122, 123, 124, 125, 126, 127, 128, 129, 130, 133, 135

One additional upper division Anthropology course chosen in consultation with A.B. degree undergraduate adviser

Teaching Credential Subject Representative. See also the Teacher Education Program.

Graduate Study. The Department offers a program of study leading to the M.A. and Ph.D. degrees in Anthropology. Further information regarding graduate study may be obtained at the Department Office and at the Graduate Division.

Graduate Adviser. R.L. Bettinger.

Courses in Anthropology

Lower Division Courses

1. Human Evolutionary Biology (4) I, Rodman; II, The Staff; III, Smith
Lecture—3 hours; discussion—1 hour. Introduction to human evolution. Processes and course of human evolution; man's place in nature and the study of primates; the biological variability of living man and the genetic background. General Education credit: Nature and Environment/Introductory. (CAN Anth 2)

2. Cultural Anthropology (4) I, Davis; II, Joseph; III, The Staff
Lecture—3 hours; discussion—1 hour. Introduction to cultural diversity and the methods used by anthropologists to account for it. Family relations, economic activities, politics, gender, and religion in a wide range of societies. Current problems in tribal and peasant societies. General Education credit: Contemporary Societies/Introductory. (CAN Anth 4)

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 Anthropological Linguistics (4) I, Wall
Lecture—3 hours; discussion—1 hour. Exploration of the role of language in social interaction and world view, minority languages and dialects, bilingualism, literacy, the social motivation of language change. Introduction of analytical techniques of linguistics and demonstration of their relevance to language in sociocultural issues. General Education credit: Contemporary Societies/Introductory.

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. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10, Anthropology 1, or Genetics 10.

23. Introduction to World Prehistory (4) III, Beaton
Lecture—3 hours; discussion—1 hour. Broadly surveys patterns and changes in the human species' physical and cultural evolution from earliest evidence for "humanness" to recent development of large-scale complex societies or "civilizations." Lectures emphasize use of archaeology in reconstructing the past. General Education credit: Nature and Environment/Introductory.

98. Directed Group Study (1-5) I, II, III, The Staff (Chairperson in charge)
Primarily intended for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III, The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

101. Human Ecology (4) II, Richerson (Environmental Studies)
Lecture—3 hours; discussion—1 hour. Prerequisite: one course from course 1, 2, Environmental Studies 30, Genetics 10, or the equivalent. Critical variables in the processes that relate humans and their environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Environmental Studies 101.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: a course from Anthropology 1, 2, Biological Sciences 10, Environmental Studies 1, 30, Geography 2, or Sociology 2.

(a) Anthropological Linguistics

110. Elementary Linguistic Analysis (4) II, Olmsted
Lecture—3 hours; discussion—1 hour. Prerequisite: course 4 or Linguistics 1. Analytical techniques of articulatory phonetics, phonemics, morphophonemics, and morphology. (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 4, or course 2 and Linguistics 1. Description and analysis of language usage in social context and of the sociocultural knowledge it reflects. Structure of speech events within communities: language in formal and informal contexts, ritual use of language, and linguistic means of marking social identity. (Same course as Linguistics 114.)

117. Language and Society (4) III, Shibamoto
Lecture—3 hours; discussion—1 hour. Prerequisite: course 4, or Linguistics 1 and course 2. Patterned covariation of language and social factors. Methods of data collection and analysis. Identification of socially significant linguistic variables. Contributions of the quantitative study of speech to linguistic theory.

120. Language and Culture (4) II, Yengoyan
Lecture—3 hours; discussion—1 hour. Prerequisite: course 4; or course 2 and Linguistics 1. Culture, cognition, meaning, and interpretation; language and the classification of experience; communication and learning in crosscultural perspective.

(b) Social-Cultural Anthropology

***121. Folklore (4) II, 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. Anthropology and Political Economy (4) I, Yengoyan
Lecture—3 hours; discussion-laboratory—1 hour. Prerequisite: course 2 or consent of instructor. Survey of anthropological approaches to the study of political organizations; the inter-relationships among political institutions, economic infrastructures and cultural complexity.

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, ritual and symbols, and religious movements. Extensive discussion of ethnographic examples and analysis of social functions of religious institutions. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2.

125. Structuralism and Symbolism (4) I, Yengoyan
Lecture—3 hours; discussion-laboratory—1 hour. Prerequisite: course 2 or consent of instructor. Survey of anthropological approaches to understanding the logic of structuralism and symbolism in cultural analysis. Course focuses on how structural and symbolic interpretations relate to cultural and linguistic universals and to the philosophical basis of relativism in the social sciences.

126. Anthropology of Development (4) III, Boyd
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Survey of theories of social and economic change. Social and economic consequences of technological innovation. Application of anthropological theory to case studies of rural economy and society.

***127. Urban Anthropology (4) 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.

129. 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 foraging, horticultural, pastoral, agricultural, and industrial societies. Impact of class and state formation, ethnicity, poverty, ruralization, urbanization, economic and political change on the "individual." Offered in odd-numbered years. (Former course 119.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2, Psychology 15-16, Sociology 2.

130. Gender and Sexuality: Cultural Evolutionary Perspective (4) I. Joseph

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Gender and sexuality in foraging bands, horticultural and pastoral tribes, agricultural and industrial states. Debates on cultural evolution and distribution of gender hierarchies. Impact of politics, economics, religion, social practices, women's movements on gender and sexuality. Culture, nature and sexuality. Offered in odd-numbered years. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2, Psychology 15-16, or Sociology 2.

131. Women and Development (4) I. Joseph

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Current Third World and Western development issues concerning women in agriculture, industry, international division of labor, political movements, revolutions, politics of health, education, family and reproduction. Impact of colonialism, capitalism, the world system, and international feminism on women and development. Offered in even-numbered years.

***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.

133. Cultural Ecology (4) III. Orlove

Lecture—3 hours; discussion—1 hour. Comparative survey of the interaction between diverse human cultural systems and the environment. Primary emphasis given to people in rural and relatively undeveloped environments as a basis for interpreting more complex environments. (Former course 141.) (Same course as Environmental Studies 133.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2.

***134. Race and Sex: Race Mixture and Mixed Populations (4) I. Forbes**

Lecture—3 hours; discussion—1 hour. Phenomena of race mixture (miscegenation), interracial marriage, and mixed (hybrid) human populations. Emphasis on social and cultural effects of race mixture and of the interaction of racism and sexual behavior. (Former course 104.)

135. Peasant Society and Culture (4) II. Orlove

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Comparative study of peasant communities, utilizing historical and ethnographic sources; analysis of urban-rural relations; problems of economic development and culture change. Offered in odd-numbered years. (Former course 162.)

137. Theory in Social-Cultural Anthropology (4) II. Boyd

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Comparative overview of major theoretical orientations in social-cultural anthropology, including evolutionary, historical, functional, ecological, psychological, structural, symbolic, and marxian approaches. Selected controversies are examined to clarify strengths and limitations of extant theories. (Former course 102.)

140A. Cultures and Societies of West and Central Africa (4) II. Curley

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Ethnographic survey of West Africa and Congo Basin with analyses of representative societies which illustrate problems of general theoretical concern. Major consideration will be the continuities and discontinuities between periods prior to European contact and the present. Offered in even-numbered years. (Former course 139A.)

***140B. Cultures and Societies of East and South Africa (4) II. Curley**

Lecture—3 hours; discussion—1 hour. Prerequisite: course

2. Ethnographic survey of Eastern and Southern Africa with analyses of selected societies which illustrate problems of interest to anthropologists. Major consideration will be given to continuities and discontinuities between periods prior to European contact and the present. Offered in odd-numbered years. (Former course 139B.)

***141A. Indians of North America (4) II. Forbes**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Introductory survey of the Indians of North America: origins, languages, civilizations, and history. (Former course 105A.)

141B. Native Americans in Contemporary Society (4) II. Forbes

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. 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. (Former course 108.)

141C. Ethnography of California and the Great Basin (4) III. Bettinger

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Description and analysis of the native peoples of California and the Great Basin and their lifeways at the time of European contact. Offered in even-numbered years. (Former course 106B.)

142. Peoples of the Middle East (4) I. Joseph

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Peoples of the Middle East (including North Africa). Discussions of class relations, kinship organization, sex/gender systems, religious beliefs and behavior, ethnic relations, political systems. Impact of world systems, political and religious movements and social change. Offered in even-numbered years. (Former course 136.)

144. Contemporary Societies and Cultures of Latin America (4) II. Orlove

Lecture—3 hours; discussion—1 hour. Prerequisite: course 2. Introduction to contemporary social structure of Latin America. Origins, maintenance and changes in inequality: economic responses to poverty, sociocultural responses to discrimination, and political responses to powerlessness. Offered in even-numbered years.

145. Colonialism and Ethnicity in the Caribbean (4) I. Crowley

Lecture—3 hours; discussion—1 hour; term paper. Prerequisite: course 2 or Afro-American Studies 10. Examination of the contemporary Caribbean nations, sketching their diverse geography, history, and economic life, then showing how selected nations have attempted to solve the problems arising from ethnic diversity in nation-building. (Former course 140.)

147. Peoples of the Pacific (4) III. 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.

148. Peoples of China (4) III. Wallacker

Lecture—4 hours. Prerequisite: course 2 or consent of instructor. Origins and development of Chinese culture in the context of the peoples of China proper and its neighboring lands. Comparisons with other high cultures are drawn to shed light on the problem of independent development versus diffusion. Offered even-numbered years. (Former course 190.)

149. 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. Offered in even-numbered years. (Former course 191.)

(c) Biological Anthropology**151. Primate Evolution (4) III. McHenry**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Zoology 2. Origin and relationships of the prosimians, monkeys, and apes.

152. Human Evolution and Fossil Man (4) II. McHenry

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Zoology 2. Nature and results of the evolutionary processes involved in the formation and differentiation of mankind. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Anthropology 1.

153. Human Biological Variation (4) II. Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Zoology 2. Origin, adaptive significance and methods of analysis of genetic differences among human populations. Special attention will be given to racial differences such as those in blood groups, plasma proteins, red cell enzymes, physiology, morphology, pigmentation and dermatoglyphics. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Anthropology 1.

154A. The Evolution of Primate Behavior (5) I. The Staff
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 100, 103, 105, or 106. Processes of micro-evolution responsible for biological differences among human populations. Special attention will be given to the adaptive significance of genetic variation in blood group antigens, serum proteins and red cell enzymes.

157L. Laboratory in Anthropological Genetics (2) II. Smith

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 1 or Biological Sciences 1, and either Genetics 100 or enrollment in course 157 (concurrently or following). Methods for identifying genetic variation in human blood group antigens, serum proteins and red cell enzymes (hemagglutination), general electrophoresis on starch, cellulose acetate and polyacrylamide, immunodiffusion and immunoelectrophoresis on agarose. Offered in even-numbered years. (P/NP grading only.)

158. The Evolution of Females and Males: Biological Perspective (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Current theoretical frameworks for explaining the evolution of sex differences and for understanding the interrelationship between biological processes and cultural construction of gender roles.

(d) Archaeology and Prehistory**170. Archaeological Theory and Method (4) II. Bettinger**

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 3. Introduction to history and development of archaeological theory and method, with particular emphasis on the basic dependence of the latter on the former. Stress is on historical development of archaeology in the New World. (Former course 103A.)

171. Archaeology and the Environment (4) I. Beaton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Examines theoretical, methodological and practical considerations in reconstruction of environmental histories and their importance in studying human ecology through archaeology. Environmental and human population dynamics and their interactions are considered particularly for non-complex societies. Offered in odd-numbered years. (Former course 103B.)

172. New World Prehistory: The First Arrivals (4) III. True

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor. Survey of data relating to the peopling of the New World. Cultural adaptation and development of early inhabitants of North and South America. Offered in even-numbered years. (Former course 103C.)

173. New World Prehistory: Archaic Adaptations (4) III. Bettinger

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor; course 170 recommended. Introduction to and survey of prehistoric hunting and gathering adaptations across North America with particular emphasis on the East, Southeast, Midwest, Plains, Southwest, and Northwest. Offered in odd-numbered years. (Former course 103D.)

***174. New World Prehistory: Formative Life-ways in North and South America (4) III. True**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor. Transition from hunting and gathering subsistence to sedentary farming in the American Southwest, Mississippi Valley, and Andean South America. Offered in odd-numbered years. (Former course 103E.)

175. New World Prehistory: The High Cultures Mesoamerica and Andean South America. (4) III. True
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor. Urban developments and the rise of civilization in Mexico and Peru. Offered in even-numbered years. (Former course 103F.)

***176. Prehistory of California and the Great Basin** (4) II. True
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 or consent of instructor. Description and analysis of the prehistoric peoples of California and the Great Basin from earliest times to European contact. Offered in odd-numbered years. (Former course 106A.)

177. Archaeology of the Pacific Rim (4) II. Beaton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3, 23 or consent of instructor; course 170 recommended. Archaeological problems and evidence pertaining to human colonization of and subsequent adaptation to various environments found on the Pacific Rim. Explanations are sought for important trajectories, trends and discontinuities in Pacific Rim culture histories. Offered in odd-numbered years.

179. Ethnoarchaeology (4) I, Beaton
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Relationships between behavior and its archaeological consequences. Ethnography by archaeologists examines residence patterning, site-formation processes, hunting/foraging behaviour and other artifact creating activities and how these contribute to modern archaeological thinking. (Former course 193.)

181. Field Course in Archaeological Method (9) summer. The Staff
Lecture—6 hours; daily field investigation. Prerequisite: course 3. On-site course in archaeological methods and techniques held at a field location in the western United States, generally California or Nevada. Introduces basic methods of archaeological survey, mapping, and excavation. (Former course 195.)

183. Laboratory in Archaeological Analysis (4) III. Bettinger
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 181 or consent of instructor. Museum preparation, advanced field investigation, and guidance in preparation of museum material for publication. May be repeated for credit with consent of instructor. Limited enrollment. Offered in even-numbered years. (Former course 196.)

184. Prehistoric Technology: The Material Aspects of Prehistoric Adaptation (4) II. True
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 or 3. Examination of the role of lithic, ceramic, textile and wooden implements as elements in prehistoric survival and development. Emphasis is descriptive, but the significance of material resources as factors in prehistoric adaptation, settlement patterns, and culture change are discussed. Offered in even-numbered years.

(e) Special Study Courses

194H. Special Study for Honors Students (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: open only to majors of senior standing who qualify for honors program. Independent study of an anthropological problem involving the writing of an honors thesis. (P/NP grading only.)

197T. Tutoring in Anthropology (1-5) I, II, III. The Staff
Tutorial—1-5 hours. Prerequisite: upper division standing with major in Anthropology and consent of Department Chairperson. Leading of small voluntary discussion groups affiliated with one of the department's regular courses. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. History of Anthropological Theory (4) I, Yengoyan
Lecture—2 hours; discussion—1 hour. Historical development of the various fields of anthropology with emphasis upon their interrelationships.

***202. History and Theory of Biological Anthropology** (4) II. The Staff
Seminar—3 hours. History of thought in biological anthropology and analysis of major theoretical problems in the field. Suggested for all first-year graduate students lacking intensive preparation in biological anthropology.

203. History and Theory of Archaeology (3) I, Bettinger
Seminar—3 hours. History of thought in archaeology and analysis of research methods.

204. Contemporary Issues in Anthropological Theory (4) II. Boyd
Seminar—3 hours; paper (one unit). Prerequisite: course

2, 137 or consent of instructor. Advanced consideration of fundamental issues in anthropological theory. Emphasis on critical examination of major contemporary debates between proponents of competing theories.

206. Research Design and Method in Social Anthropology (5) III. 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, pre-fieldwork preparations, entering the community, field research techniques, and problems of ethics; intensive work on proposal writing. May be repeated once for credit. Limited enrollment.

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. The Staff
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 133 or the equivalent or consent of instructor. Discussion and evaluation of theories which relate environment, culture and social structure. The works of several major theorists will be examined with regard to analytical models, empirical data, research methodologies, and modes of explanation. Offered in odd-numbered years. (Same course as Ecology 211.)

216. Problems in Archaeological Method (4) II. Beaton
Seminar—3 hours. Techniques for analyzing archaeological data; application to various prehistoric cultures. May be repeated for credit with consent of instructor.

***217. Andean Prehistory: Theory and Method** (4) II. True
Seminar—3 hours. Prerequisite: consent of instructor. Discussion and evaluation of prehistoric occupations in the Andean Region of South America. Emphasis upon Pre-ceramic and early farming peoples.

***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. Yengoyan
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. The Staff
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, 157, or consent of instructor. Study of selected topics in human biology. May be repeated for credit when topics vary. Offered in odd-numbered years.

254. Current Issues in Primate Sociobiology (4) III. Rodman
Seminar—3 hours; term paper. Prerequisite: course 154B or the equivalent. Analysis of primate behavior, with particular emphasis on preparation for field studies. May be repeated for credit when different topic covered.

***265. Concepts and Problems in Applied Anthropology** (4) II. The Staff
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. 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 ethno-history in the solution of contemporary social problems.

292. Seminar in Anthropological Linguistics (4) III. Wall
Seminar—3 hours.

296. 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)

Michael P. Smith, Ph.D., Chairperson of the Department

Lawrence V. Harper, Ph.D., Vice Chairperson of the Department

Department Office, 106 Academic Office Building-4

Community Studies and Development (752-0770)

Human Development (752-0771)

Faculty

Curt Acredolo, Ph.D., Lecturer
J. Howard Adams, Ph.D., Professor Emeritus
Louise M. Bachtold, Ed.D., Professor Emeritus
Keith Barton, Ph.D., Professor
Edward J. Blakely, Ed.D., Professor
Marc Braverman, Ph.D., Lecturer
Stephen B. Brush, Ph.D., Associate Professor
Brenda K. Bryant, Ph.D., Professor
Glen Burch, Ed.D., Lecturer Emeritus
Susan Crockenberg, Ph.D., Professor
Noreen G. Dowling, Ph.D., Lecturer
Jack D. Forbes, Ph.D., Professor (*Applied Behavioral Sciences, Anthropology*)
Isao Fujimoto, M.A., Lecturer S.O.E.
Barbara G. Goldman, Ph.D., Lecturer and Supervisor of Teacher Education

James Grieshop, Ph.D., Lecturer
 Lawrence V. Harper, Ph.D., Professor
 Glenn R. Hawkes, Ph.D., Professor
 Sarah V. Hutchison, M.Ed., Lecturer Emeritus
 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 S.O.E.
 George C. Longfish, M.F.A., Professor
 David B. Lynn, Ph.D., Professor Emeritus
 E. Dean MacCannell, Ph.D., Professor
 Loren Parks, Ph.D., Lecturer
 Robert W. Pershing, M.Ed., Lecturer
 Marc Pilisuk, Ph.D., Professor
 Ernesto Pollitt, Ph.D., Professor
 David Risling, M.A., Senior Lecturer S.O.E.
 Michael P. Smith, Ph.D., Professor
 Orville E. Thompson, Ph.D., Professor Emeritus
 Gary F. Varrella, Ed.D., Supervisor of Teacher Education
 Jane N. Welker, M.A., Senior Lecturer S.O.E.
 Miriam J. Wells, Ph.D., Associate Professor
 Emmy E. Werner, Ph.D., Professor

The Major Program

The Applied Behavioral Sciences major provides a broad, comparative understanding of social science theories, methodologies, and issues relevant to the study of communities and the people in them. The program is concerned with the study of social organization and change, and with the ways that information can be used to solve social problems and improve quality of life. The major emphasizes the integration of theory and practical experience and features a perspective on learning that stresses self-development and critical thinking.

Two identifying features of the major are: (1) its interdisciplinary character, enabling students to bring together courses from different disciplines; and (2) its emphasis on viewing social problems in context, enabling students to master not only a circumscribed area of expertise but to understand the social setting in which the expertise will be applied.

Principal subjects of study within the major are: community and organizational development, social change processes, the role of culture and ethnicity in shaping community life, community research methodologies, the impacts of innovation and technology on community development, and the effects of social, economic and political systems on communities and the people in them. In addition, the Applied Behavioral Sciences major includes a student designed area of specialization to complement the student's academic and career interests. Examples of recently approved areas of concentration are: Organizational Planning and Management, Aging and Community Development, Community Health Development, Community Mental Health, Community Development and the Asian American, Socio-Environmental Planning, and Community Education.

Applied Behavioral Sciences graduates are prepared for occupations in community and human services. Areas of employment have been in community development, social research, program evaluation, organizational and educational consulting, city and regional planning, and community health. The major provides effective preparation for graduate or professional study in the social and behavioral sciences.

Applied Behavioral Sciences

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	22-26
Introduction to community development, Applied Behavioral Sciences 1	4
Ethnicity and American communities, Applied Behavioral Sciences 2	4

Introduction to social science theory, Anthropology 2 or Sociology 1, and Economics 1A or 1B	9-10
Statistics, Statistics 13 or 32	3-4
Computer logic or programming, Agricultural Science and Management 21, Computer Science Engineering 10, or Sociology 40	2-3
Breadth Subject Matter	40
Written or oral expression, to include English 103 (see College requirement)	12
Science and mathematics	12
Humanities	8
(Proficiency in second language is specifically useful to an understanding of particular aspects of the community. Students planning to work in a minority community are encouraged to select an appropriate second language.)	
Social sciences (choose from Anthropology, Economics, Political Science, Psychology, Sociology)	8
Depth Subject Matter	39
Methods for community research, Applied Behavioral Sciences 151, and 160 or 161	8
Social theory and community change, Applied Behavioral Sciences 154	4
Institutional and organizational change, Applied Behavioral Sciences 164	4
Political processes and community change, one course from Applied Behavioral Sciences 157, Anthropology 123, Political Science 101, 102, 103, 173	4
Economics and community change, one course from Applied Behavioral Sciences 162, Anthropology 122, Economics 115A, 115B	4
Ethnicity and social inequality, Applied Behavioral Sciences 172 or 176	4
Community development and transfer of knowledge, one course from Applied Behavioral Sciences 152, 170, 173, 175	4
Evaluation of human service programs, Applied Behavioral Sciences 168	4
Senior research project and seminar, Applied Behavioral Sciences 193A, 193B, 193C	3
Field of concentration	37
Additional upper division courses related to the major, determined in consultation with faculty adviser. (Up to 5 units of variable-unit coursework may be counted toward this requirement, e.g., Applied Behavioral Sciences 159, 192, 196, 197, 199.)	
Unrestricted Electives	38-42
Total Units for the Major	180

Other Requirements

In consultation with a faculty and staff adviser, Applied Behavioral Sciences majors must develop a program of study which will comprise an area of specialization. Students must submit a written proposal for the major to be reviewed by a faculty committee. The department also requires satisfactory completion of a faculty supervised senior project.

Major Adviser. E.D. MacCannell.

Advising Center for the major is located in 101 Academic Office Building-4 (752-2244).

Minor Program Requirements:

The Applied Behavioral Sciences faculty offers the following minor programs:

	UNITS
Aging and Adult Development	23-29
Applied Behavioral Sciences 177, 191	6
Human Development 100C	4
Community Health 180	3
Human Development 110, Applied Behavioral Sciences 173	8
Practicum, 2 units minimum	2-8
Minor Adviser. G.R. Hawkes.	
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.	
Minor Adviser. P.C.Y. Leung.	

NOTE: For key to footnote symbols, see page 131.

UNITS

Community Development	24
Applied Behavioral Sciences 1, 151, 152, 164	16
Two courses selected from the 160 and/or 170 series	8
(a) Applied Behavioral Sciences 162, 163, 168	
(b) Applied Behavioral Sciences 171, 172, 173, 174, 175, 176, 177, 178.	

Minor Adviser. E.D. MacCannell.

UNITS

Graduate Study. Refer to the Graduate Division section in this catalog.

Related Courses. See Environmental Studies 10, 101, 133.

Courses in Applied Behavioral Sciences

Lower Division Courses

1. The Community (4) I, MacCannell
 Lecture—4 hours. Basic concepts of community analysis and planned social change. The dynamics of community change through case studies of communities including peasant, urban ghetto, suburban mainline and California farm workers

2. Ethnicity and American Communities (4) II. The Staff
 Lecture—3 hours; discussion—1 hour. Historical and cultural survey of the role of various ethnic groups in the development of American communities. Examines ethnicity as a cultural factor, ethnicity as power and issues related to selected American ethnic groups. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2.

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 stability. (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.

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. (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: course 1, Sociology 2, Anthropology 2, or Geography 5. Theories of community change and structure. Ethnographic, power structure and comparative approaches to community studies. Use of research in community development programs. Students work in teams and conduct fieldwork in nearby communities. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: a course from Anthropology 2, Geography 5, or Sociology 2.

152. Community Development (4) II. Fujimoto
 Lecture—4 hours. Prerequisite: course 151 or 1, Sociology 2, Anthropology 2, Geography 5, Asian-American Studies 100, Chicano Studies 101, or Afro-American Studies 101. Introduction to principles and strategies of community organizing and development. Examination of different citizen

participation movements and the role of change agents in the development process. Students work in teams and conduct fieldwork in local communities.

153. International Community Development (4) III. Fujimoto
Lecture—4 hours. Prerequisite: course 1, Anthropology 2, International Agricultural Development 10. Examination of community development efforts worldwide. Analysis of impact of global forces on community development in different settings. Alternative strategies with emphasis on self-reliance and locally controlled development. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: a course from course 151, Anthropology 2, or International Agricultural Development 10.

154. Semiotics, Structuralism and Sociocultural Change (4) II. MacCannell

Lecture—4 hours. Prerequisite: course 1, Sociology 1, or Anthropology 2. Existentialism, structuralism, and semiotics and their application to current social issues and problems: nuclear technology, women's movement, ethnic relations, and other change arenas. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2 or Sociology 2.

157. Politics and Community Development (4) III. Smith
Lecture—4 hours. Prerequisite: prior coursework in sociology or political science recommended. Analyzes political, economic and sociocultural forces shaping the form and function of local communities in the U.S.. Considers theories of the state, the community and social change and case studies of actual community development in comparative historical perspective.

159. Field Experience in Community Development (4-6) II. Piliusuk; III, Fujimoto
Discussion—2 hours; fieldwork—6-12 hours. Prerequisite: courses 151 or 152; consent of instructor. Field involvement with community based organization. Study of community or organizational issues or problems and their resolution. May be repeated for credit for a maximum of 12 units following consultation with and consent of instructor.

160. Research Design and Method in Community Studies (4) III. The Staff

Lecture—4 hours. Prerequisite: course 1; Statistics 13 or the equivalent. Application of behavioral science research methodology to multidisciplinary problems confronting communities and community organizations. Focuses on design, sampling, measurement and analysis.

***161. Ethnographic Research in America (4) II.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: completion of 8 units of course work in Anthropology, Sociology, or Applied Behavioral Sciences. Methodologies, ethics and goals of qualitative research. Emphasis on analyzing and conducting ethnographic research in American communities; problem formulation, analytic modes, data correction and interpretation. Offered in odd-numbered years.

162. People, Work and Technology (4) I. Wells
Lecture—4 hours. Prerequisite: coursework in the social sciences (e.g., Sociology 1, 3, Anthropology 137, Economics 1A, 1B) or labor history. Relationship between work, technology, and people's lives. Such topics as industrialization, bureaucratization, automation, the structure of work-linked communities, education and the labor market, work and the economic system and the future of work.

163. Behavior of Community Organizations (4) I. The Staff
Lecture—4 hours. Prerequisite: introductory social sciences course. How community organizations function and how members of organizations interact with each other, the organization, and those people who are clients of the organization. Effects of leadership, motivation, group dynamics, communications, and power.

164. Theories in Organizational Change (4) II. The Staff
Lecture—2 hours; discussion—2 hours. Prerequisite: course 162. The organization as an open system which changes in response to internal and external environment. Emphasis on structural, technological and humanistic approaches to change.

***165. Family Resource Management (4) II.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Human Development 110; upper division standing. Influence of social, economic, political and technological environments on family roles, goals, and decisions. Examination of family resource management strategies and social support systems for families.

168. Program Evaluation and the Management of Organizations (4) I. Goldman

Lecture—3 hours; discussion—1 hour. Prerequisite: course 160, 161, or the equivalent. Program evaluation and its relationship to organizational development and management functions. Focuses on internal evaluation and its role in program planning improvement and accountability.

170. Communication of Innovations (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and coursework in the social sciences; course 1 or Sociology 1 recommended. Information exchange

and innovation diffusion in organizational and social settings. Exploration of the role of information networks and communication channels in planned social change efforts. Philosophical consideration of the consequences of innovation dissemination.

171. Housing and Social Policy (4) III. Wells

Lecture—4 hours. Social impact, economics, and politics of housing in the United States. Special attention given to alternative policy strategies at the national levels.

172. Social Inequality: Issues and Innovations (4) III. Wells
Lecture—4 hours. Prerequisite: upper division standing; 8 units of sociology or anthropology or combination. Study of the phenomenon of inequality in the U.S. Various approaches to inequality will be examined, including structural and historical explanations, prejudice and discrimination, the "culture of poverty," and arguments concerning race, sex, and genetic potential.

173. The Continuing Learner (4) II. 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. Communication for Community Change (4) I. Grieshop
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and course 1 recommended. Applied communication programs used for creating community change. Planning and evaluating programs, social marketing, and other communication strategies and technologies. Ethics of change induced through communication are also considered. Offered in even-numbered years.

***175. Education in the Community (4) I.** Grieshop
Lecture—4 hours. Prerequisite: upper division standing and coursework in the social sciences; course 1 or Sociology 1 recommended. Function of education in the community. Relationships of community and non-formal education to formal education, schooling and to individual, community and national development. Planning process and role of education in social and community change.

176. Comparative Ethnicity (4) III. The Staff
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—4 hours. Prerequisite: Human Development 100C or Psychology 115. Major characteristics, needs and interests of older people in contemporary America. Emphasis on social problems and community approaches to their solutions.

178. Social Networks and Community Health (4) III. Piliusuk
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Sociology 2. Relevance of social ties to the health of the individual, family and community. Multidisciplinary look at forces affecting family and friendship ties, as well as community services; and at how social bonds affect physical and psychological health. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Sociology 2.

190. Current Issues in Applied Behavioral Sciences (1) I, II, III. The Staff

Seminar—1 hour. Current social, political, and economic issues affecting communities and individuals. One-hour presentations by guest speakers on research topics and contemporary issues in Community Development. (P/NP grading only.)

***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.)

193A-193B-193C. Applied Behavioral Sciences Research Seminar (1-1-1) I-II-III. The Staff

Seminar—1 hour. Prerequisite: upper division standing; Applied Behavioral Sciences major. Seminar on problem focused research. Includes processes for problem identification, methods for data collection and analysis and procedures for interpretation and report writing. (P/NP grading only.)

196. Senior Project in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: major in Applied Behavioral Sciences, and consent of instructor. Guided research leading to completion of senior thesis. May be repeated for credit. (P/NP grading only.)

197T. Tutoring in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Leading of small voluntary discussion groups. (P/NP grading only.)

197TC Community Tutoring in Applied Behavioral Sciences (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Supervised tutoring in the community. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201. Planning Processes in Applied Behavioral Sciences (4) I. The Staff

Lecture—3 hours; supervised practice in planning—3 hours. Prerequisite: consent of instructor. Systematic approach to planning, including new concepts, theories, and methods for planning with application to educational institutions, agencies and the community at large.

202. Systems Approach for Organizational Change (4) II. The Staff

Lecture—4 hours. Prerequisite: course 201 or consent of instructor. Organizational structure and processes from systems perspective, organization-environment interplay, dynamics of resource allocation, impact of power and environment on structure, communication networks, role of innovation and determinants of change. Emphasis upon applications of theory for organizational learning.

203. Evaluation and Decision Making (4) III. Goldman

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing; knowledge of social science research design and methods. Focuses on theoretical formulations and methodological considerations when designing evaluation research studies for social programs. Includes examination of relationship between organizational planning, decision-making and evaluation research; value conflicts; multiple information requirements; social and political environment influencing evaluation studies.

240. Community Development: Research and Analysis (4) I. MacCannell

Seminar—4 hours. Prerequisite: course 160 or Sociology 46A or the equivalent and a course in statistics. Methods for 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. Piliusuk

Lecture—2 hours; seminar—2 hours. Prerequisite: graduate student standing in a social science discipline. Theory of interpersonal communication and small group process as applied to development of professional skills as community developer, program administrator and/or consultant.

290. Seminar (1) I, II, III. The Staff

Seminar—1 hour. Analysis of research in applied behavioral sciences. (S/U grading only.)

297. Practicum in Community Development (2) II. Piliusuk

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 (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Applied Mathematics (A Graduate Group)

Craig A. Tracy, Ph.D., Chairperson of the Group
Group Office, 551 Kerr Hall (752-8131)

Faculty. Consists of members from several departments—Agricultural Economics, Biological Sciences, Chemistry, Computer Science Engineering, Economics, Chemical, Civil, Electrical, and Mechanical Engineering, Environmental Studies, Epidemiology and Preventive Medicine, Genetics, Land, Air and Water Resources, Management, Mathematics, Obstetrics and Gynecology, Statistics, and Wildlife and Fisheries Biology.

Graduate Study. Students prepare for careers relating to the application of mathematics to problems in the physical and life sciences, engineering, and management. The M.S. degree provides preparation (1) for further study in applied mathematics or an application area, or (2) for a career in industry or public service. The Ph.D. degree provides preparation for a career in research and/or teaching. Areas of research in the program include differential equations, fluid mechanics, numerical analysis, operations research, systems theory, probability and stochastic processes, mathematical biology, and mathematical physics. Detailed information may be obtained by writing to the Graduate Coordinator, Department of Mathematics.

New applicants are admitted to the fall quarter *only*.

Preparation. The program encourages application from students who have prior training in engineering, physical and life sciences, mathematics, economics, and related fields. Applicants must have completed two years of undergraduate mathematics including linear algebra, differential equations, and vector calculus.

Graduate Advisers. A. M. Hastings (Mathematics); S. Whitaker (Chemical Engineering).

Applied Physics

See Physics

Aquaculture

See Animal Science,
Agricultural Engineering
Technology, and
Wildlife and Fisheries
Biology

Art

(College of Letters and Science)

Cornelia Schulz, M.F.A., Chairperson of the
Department

Department Office, 111A Art Building (752-0105)

Art History

(Art History can be found immediately following
Art Studio.)

Art Studio

Faculty

L. Price Amerson, Jr., Ph.D., Adjunct Lecturer
(*Director, Nelson Gallery*)
Robert C. Arneson, M.F.A., hon. Ph.D. (S.F.A.I.,
R.I.S.D.) Professor
Squeak Carnwath, M.F.A., Assistant Professor
Richard D. Cramer, M.F.A., Professor Emeritus
William Henderson, M.F.A., Professor
Harvey Himelfarb, M.A., Professor
David Hollowell, M.F.A., Assistant Professor
Ralph M. Johnson, M.A., Professor
Manuel J. Neri, Professor
Roland C. Petersen, M.A., Professor
Lucy A. Puls, M.F.A., Assistant Professor
Cornelia Schulz, M.F.A., Associate Professor
Wayne Thiebaud, M.A., hon. D.F.A. (C.C.A.C.,
D.C.) 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 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 instructors, chosen from Group A, Practice of Art.	24
One course from Group B, Theory and Criticism	4
Two upper division courses in art history	8
Total Units for the Major	56

Recommended

- (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.

Major Advisers. See the *Class Schedule and Room Directory*.

Minor Program Requirements:

	UNITS
Art Studio	20
Upper division art studio courses chosen in consultation with a faculty adviser (one lower division substitute course permissible)	20
Prerequisite courses must be taken prior to enrollment in upper division courses. Independent study courses are not applicable.	

Teaching Credential Subject Representative. Department Chairperson. See also the Teacher Education Program.

Graduate Study. The Department of Art offers programs of study and research leading to the M.F.A. degree in the practice of art. Detailed information regarding graduate study may be obtained from the *Graduate Announcement* or Graduate Admissions Office.

Courses in Art (Studio)

Lower Division Courses

- 2. Drawing I** (4) I, II, III. Arneson, Carnwath, Henderson, Johnson, and staff
Laboratory—8 hours; to be arranged—4 hours. Form and composition in black and white. (CAN Art 8)
- 3. Drawing II** (4) I, II, III. Carnwath, Schulz, 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. Petersen, Neri, Thiebaud
Laboratory—8 hours; to be arranged—4 hours. Prerequisite: course 2. Form in composition using the human figure as subject.
- 5. Sculpture** (4) I, II, III. Puls, Neri, The Staff
Laboratory—8 hours; to be arranged—4 hours. Form in space using plaster and other media.
- 10S. Introduction to Art Appreciation:** (4) I, II. Hollowell
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. Schulz, and 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. Carnwath, Schulz
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Experimentation in media and their supports.
- 102. Painting** (4) I, II, III. Schulz and 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 once for credit with consent of instructor.
- 103. Advanced Drawing** (4) II. Hollowell
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. May be repeated once for credit with consent of instructor.
- 104. Figure Drawing and Painting** (4) I, II, III. Thiebaud, Hollowell, Johnson
Laboratory—12 hours. Prerequisite: courses 4 and 101, or consent of instructor. Advanced figure drawing and painting using the human figure as subject. May be repeated once for credit with consent of instructor.
- 110. Photography I** (4) I, II, III. Petersen, and staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Photography as an art form. Experiments with camera and light sensitive materials.
- 111. Photography II** (4) III. The Staff
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 110 or consent of instructor. Art of camera and light sensitive materials: tonal control, multiple exposure, synthetic negatives, etc. May be repeated once for credit with consent of instructor.
- 115. Film-making I** (4) II. Henderson
Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, or consent of instructor. Film-making as an art form; 8 and 16 mm. cameras and sound track. May be repeated once for credit with consent of instructor.
- 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.
- 125. Printmaking: Relief** (4) I, II. Carnwath, Petersen
Laboratory—8 hours; to be arranged—1 hour. Prerequisite:

courses 2, 3, 4, 5, or consent of instructor. Woodcut, linocut, metal-plate relief and experimental uses of other materials.

126. Printmaking: Intaglio (4) I, III. Petersen, Thiebaud Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Metal plate etching, aquatint, hard- and soft-ground, burin engraving and related methods. May be repeated once for credit with consent of instructor.

***127. Printmaking: Lithography** (4) III. The Staff Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2, 3, 4, 5, or consent of instructor. Stone and metal-plate lithography and other planographic methods. May be repeated once for credit with consent of instructor.

128. Printmaking: Serigraphy (4) II, The Staff 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 with consent of instructor.

141. Sculpture: Non-Metal Materials (4) I. Puls 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 once for credit with consent of instructor.

142. Sculpture: Ceramics I (4) I, III. Arneson, the Staff Laboratory—8 hours; 1 hour to be arranged. Prerequisite: course 2, 3, 4 and 5, or consent of instructor. Introduction to ceramic forms and processes.

143. Sculpture: Ceramics II (4) II. Arneson Laboratory—8 hours; 1 hour to be arranged. Prerequisite: course 142 or consent of instructor. Introduction to color, as well as glazing and use of kiln. May be repeated once for credit with consent of instructor.

144. Sculpture: Figure Modeling (4) 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 with consent of instructor.

145. Sculpture: Concepts and Materials (4) II. Puls Laboratory—8 hours; to be arranged—1 hour. Prerequisite: courses 2 and 5. Relationship between ideas and three-dimensional visual communication is explored in depth through the use of a variety of approaches and materials. May be repeated once for credit with consent of instructor.

***146. Sculpture: Ceramics III** (4) III. The Staff Laboratory—8 hours; to be arranged—1 hour. Prerequisite: course 141, 143, 144, or 145. Advanced form and color. Clay sculpture in relief and round. May be repeated once for credit with consent of instructor.

Group B: Theory and Criticism

***147. Theory and Criticism of Photography** (4) II. Himelfarb Lecture—3 hours; term paper. Prerequisite: course 2 or 5 and one art lecture course. Development of camera vision, ideas, and aesthetics and their relationship to the fine arts from 1839 to the present.

148. Theory and Criticism: Painting and Sculpture (4) II. Thiebaud Lecture—3 hours; term paper. Prerequisite: course 2 or 5, and one art lecture course. Study of forms and symbols in historic and contemporary masterpieces.

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, II, III. The Staff Lecture—3 hours. Original work produced for class discussion and criticism. May be repeated for credit.

290. Seminar (4) I, II, III. 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) II. The Staff (Graduate Adviser in charge) Seminar—1 hour. May be repeated for credit. (S/U grading only.)

292. Seminar: Comprehensive Qualifying (1) I. The Staff (Graduate Adviser in charge) Seminar—1 hour. Further critical evaluation of the student's work to determine his eligibility to begin the Comprehensive Project. May be repeated for credit. (S/U grading only.)

299. Individual Study (1-6) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299D. Comprehensive Project (9) III. The Staff (Graduate Adviser in charge) An original body of work accompanied by a catalog summarizing the student's aesthetic position. May be repeated for credit. (S/U grading only.)

Professional Courses

401. Museum Training: Curatorial Principles (4) II. Amerson Seminar—3 hours.† Study of private and public collections. Museum personalities. Appraisal of works of art; ethics of appraisal. Auction and sales: methods and catalogs. 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

Joseph A. Baird, Ph.D., Professor Emeritus
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
Dianne Sachko Macleod, Ph.D., Assistant Professor

Jeffrey Ruda, Ph.D., Associate Professor
Deborah Weiner, 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, painting, or photography	4
One art studio course in sculpture or ceramics	4

Depth Subject Matter	36
Nine upper division art history courses, which must be taken in at least five of the following seven areas	36
(a) Ancient	
(b) Medieval/Northern Renaissance	
(c) Southern Renaissance/Baroque	
(d) Modern Painting, Sculpture	
(e) Modern Architecture	
(f) China/Japan	
(g) Non-Literate	

Total Units for the Major 60

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 Painting, Sculpture; (e) Modern Architecture; (f) China/Japan; and (g) Non-Literate.	

Honors Program. An Honors Program is available to Art History majors who are seriously considering attending graduate school. To be eligible for the program, a student must have a grade-point average of 3.7 in the major. In addition to meeting the standard major requirements, the honors student completes one quarter of language in German or Chinese, one seminar (courses 190 or 198), and writes an honors thesis (course 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 also 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. The Staff Lecture—3 hours; discussion—1 hour. Art of the pagan Mediterranean world from the prehistoric caves to the fall of the Roman Empire. General Education credit with concurrent enrollment in course 1AG: Civilization and Culture/Introductory.

1AG. Writing: On Ancient Art (I) I. The Staff Discussion—1 hour; short papers. Prerequisite: course 1A (concurrently). Small group discussions and preparation of short papers for art 1A. General Education credit with concurrent enrollment in course 1A: Civilization and Culture/Introductory.

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. General Education credit with concurrent enrollment in course 1BG: Civilization and Culture/Introductory.

1BG. Writing: On Medieval-Renaissance Art (I) II. Grigg Discussion—1 hour; short papers. Prerequisite: course 1B (concurrently). Small group discussions and preparation of short papers for Art 1B. General Education credit with concurrent enrollment in course 1B: Civilization and Culture/Introductory.

1C. Baroque and Modern Art (4) III. Macleod Lecture—3 hours; discussion—1 hour. Major styles and masters of the Western world after the Counter Reformation. General Education credit with concurrent enrollment in course 1CG: Civilization and Culture/Introductory.

1CG. Writing: On Baroque-Modern Art (I) III. Macleod Discussion—1 hour; short papers. Prerequisite: course 1C

(concurrently). Small group discussions and preparation of short papers for Art IC. General Education credit with concurrent enrollment in course 1C: Civilization and Culture/Introductory.

1D. Asian Art (4) I. Fong

Lecture—3 hours; discussion—1 hour. Introduction to the arts of Asia through a study of Oriental ink painting and architecture, Buddhist sculpture, Indian temples, Chinese ceramics, Japanese prints, and art in Mao's China. General Education credit with concurrent enrollment in course 1DG: Civilization and Culture/Introductory.

1DG. Writing: On Asian Art (I) I. Fong

Discussion—1 hour; short papers. Prerequisite: course 1D (concurrently). Small group discussions and preparation of short papers for Art ID. General Education credit with concurrent enrollment in course 1D: Civilization and Culture/Introductory.

10H. Introduction to Art: Art and Civilization (4) III. Ruda
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) I. 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 cuts, ancestral worship, Confucian lore, Taoist legends, and Buddhist beliefs. Intended for non-majors.

25. Introduction to Architectural History (4) III. Weiner
Lecture—3 hours; discussion—1 hour. Formal and social history of architecture, examining design principles, major traditions and concepts of architectural history with a focus on issues in Western architecture. Emphasis on nineteenth and twentieth centuries. General Education credit with concurrent enrollment in course 25G: Civilization and Culture/Introductory.

25G. Writing: Introduction to Architectural History (1) III. Weiner

Discussion—1 hour. Prerequisite: course 25 concurrently. Small group discussions and preparation of short papers for course 25. General Education credit with concurrent enrollment in course 25: Civilization and Culture/Introductory.

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 Sub-Saharan Africa (4) I. Crowley
Lecture—3 hours; term paper or gallery studies and review. Traditional arts and crafts of sub-Saharan Africa; particular attention to the relationships between sculpture and culture in West and Central Africa.

151. Arts of the Indians of the Americas (4) II. Crowley
Lecture—3 hours; term paper or gallery studies and review. Development of art in North America, emphasizing ancient Mexico. South American relationships and parallels. Recent and contemporary Indian arts and crafts from Alaska to Chile.

152. Arts of Oceania and Prehistoric Europe (4) III. Crowley
Lecture—3 hours; term paper. Traditional arts of aboriginal Australia, Melanesia, Polynesia, and Micronesia, as seen in their cultural contexts. Prehistoric art of Europe and the Near East.

154A. Early Greek Art and Architecture (4) II. 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) III. 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) III.** 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 twentieth 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. Great Cities (4) I.** Weiner

Lecture—3 hours; term paper. Transformation in architecture and urban form in Paris, London, and Vienna in the context of varying social, political, and economic systems as well as very different cultural traditions, concentrating on the years 1830-1914. Offered in odd-numbered years.

176A. Art of the Middle Ages: Early Christian and Byzantine Art (4) I. Grigg

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of the early Christian era and Byzantine Empire; through the later Roman Empire in the West and to the final capture of Constantinople in the East.

176B. Art of the Middle Ages: Early Medieval and Romanesque Art (4) III. Grigg

Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture of western Europe in the early medieval era: from the rise of the barbarian kingdoms through the twelfth century.

***176C. Art of the Middle Ages: Gothic (4) III.** The Staff
Lecture—3 hours; term paper or gallery studies and review. Painting, sculpture and architecture in northern Europe from the twelfth through the fifteenth centuries.

177A. Northern European Art (4) III. Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the fifteenth century in Austria, Germany, France and the Lowlands, including such artists as Jan van Eyck and Hieronymus Bosch.

***177B. Northern European Art (4) I.** Grigg
Lecture—3 hours; term paper or gallery studies and review. Painting and sculpture of the sixteenth century in Germany, France and the Lowlands, including such artists as Albrecht Dürer and Pieter Bruegel.

178A. Italian Renaissance Art (4) II. Ruda
Lecture—3 hours; term paper or gallery studies and review. Giotto and the origins of the Renaissance; painting and sculpture in Italy from Nicola Pisano through Lorenzo Monaco, with emphasis on Duccio, Giotto, and other leading artists of the early fourteenth century.

***178B. Italian Renaissance Art (4) II.** Ruda
Lecture—3 hours; term paper or gallery studies and review. Early Renaissance in Florence; fifteenth-century artists from Donatello and Masaccio through Botticelli, in their artistic and cultural setting.

178C. Italian Renaissance Art (4) III. Ruda
Lecture—3 hours; term paper or gallery studies and review. The High Renaissance: Leonardo, Michelangelo, Raphael, and Titian in their artistic and cultural settings—Florence, Rome, and Venice in the early sixteenth century. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Art 1B-1BG.

179A. Baroque Art (4) I. The Staff
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) I.** 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) II.** Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least

one course in art or consent of instructor. Social and cultural study of major European art movements between 1860 and 1900, including an examination of the paintings of Manet, Monet, Renoir, Whistler, Gauguin, van Gogh, Cezanne, and Redon.

183C. Modern Art: 1900-1945 (4) I. Macleod
Lecture—3 hours; discussion—1 hour. Prerequisite: at least one course in art or consent of instructor. Examination of modern movement in European art from Fauvism and Cubism to Surrealism and Abstract Expressionism (1900-1945). Artists studied include Picasso, Matisse, Kandinsky, Malevich, and Pollock.

183D. Modern Sculpture (4) 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) III. 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, Earth-works, and Feminist art.

184. Architecture in the Twentieth Century (4) II. The Staff
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) II.** 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.

188B. Architecture of the United States (4) I. The Staff
Lecture—3 hours; term paper or gallery studies and review. American building, with emphasis on early colonial, Georgian, nineteenth and twentieth century developments. Particular attention to Northern California in the latter part of the course.

***188C. Painting of the United States (4) I.** 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, II, 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

200. Introduction to Art Historical Research (4) I. Grigg
Seminar—4 hours. Introductory sampling of major writings, methods, and sources used for research in the discipline of art history.

250. Problems in Art Historical Research (4) III. Howard
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) II.** 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. May be repeated for credit with consent of instructor.

***254. Seminar in Classical Art (4) II.** Howard
Seminar—3 hours; term paper. Selected areas of special study in classical art of the Greek and Roman tradition. Course may be repeated for credit with consent of instructor.

***263. Seminar in Chinese Art (4) I.** Fong
Seminar—3 hours; paper. Selected areas of special study in Chinese Art. May be repeated for credit with consent of instructor.

265. Seminar: The Orient in Western Art (4) I. Fong
Seminar—3 hours; term paper. Selected topics in European and American art which demonstrates an assimilation of oriental art. May be repeated for credit with consent of instructor.

***276. Seminar in Medieval Art (4) III.** Grigg
Seminar—3 hours. Selected areas of special study in medieval art from Early Christian to late Gothic. May be repeated for credit with consent of instructor.

***277. Seminar in Northern Renaissance Art (4) III.** Grigg
Seminar—3 hours. Selected areas of special study in Netherlandish and German art of the fifteenth and sixteenth centuries. May be repeated for credit with consent of instructor.

278. Seminar in Italian Renaissance Art (4) II. Ruda
Seminar—3 hours; term paper. Selected areas of special study in Italian art from the fourteenth to the sixteenth century. May be repeated for credit with consent of instructor.

283. Seminar in Modern European Art (4) II. Macleod
Seminar—3 hours; term paper. Selected areas of special study in art since 1800 in Europe. May be repeated for credit with consent of instructor.

288. Seminar in European and American Architecture (4) III. Weiner
Seminar—3 hours. Exploration of selected topics in European and American architectural history with concentration on the Modern Period. May be repeated for credit with consent of instructor.

299. Individual Study (1-6) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. Introduction to Teaching Art History for Teaching Assistants (1) I, II, III. The Staff
Discussion—1 hour. Designed for teaching assistants with emphasis on problems and procedures encountered by teachers of undergraduate art history. (S/U grading only.)

Professional Courses

401. Museum Training: Curatorial Principles (4) II. Amerson
Seminar—3 hours. † 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 and Art Studio

See Art (above)

Asian American Studies

(College of Agricultural and Environmental Sciences)

Faculty. See under Department of Applied Behavioral Sciences.

Program of Study. Concentration in Asian American Studies is available through the Applied Behavioral Sciences major. A minor program, Asian American Studies (see under Applied Behavioral Sciences),

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. (See also under University requirements.)

Related Courses. For courses in Asian languages, see Cantonese (below) and Chinese, and Japanese. For other Asian courses, see Chinese and Japanese and East Asian Studies.

Courses in Asian American Studies

Direct questions pertaining to the following courses to the instructor or to the Applied Behavioral Sciences Advising Center, 101 Academic Office Building-4 (752-2244).

Lower Division Courses

1. Introduction to Asian American Studies (4) I, III. The Staff
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) II.** Leung
Lecture—2 hours; laboratory—3 hours. Prerequisite: knowledge of Cantonese, Mandarin or Japanese helpful. Introduction to Asian calligraphy stressing the technique of writing.

92. Internship (1-12) I, II, III. The Staff (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) III.** 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 programs 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. Examination of self-awareness, alienation, and life perspective of Asians in America. Emphasis will be placed on problems of identity formation of Asian Americans.

112. Asian American Women (4) II. The Staff
Lecture—4 hours. Prerequisite: course 1 or 2. History and struggle of Asian women in America; critically analyze their media images and stereotypes; and discuss in-depth the role of Asian Women in the community movement for social change.

***130. Asian American Literature/Ethnography (4) III.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 2 recommended, or consent of instructor. Asian American literature as ethnographic data; analysis of literary works by Asian American authors as descriptions of culture and social organization. Offered in even-numbered years.

***150. Filipino American Experience (4) III.** The Staff
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.** The Staff
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; 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; climate variations; 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 mathematics, com-

puter 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	71
Mathematics (Mathematics 21A, 21B, 21C, 22A, 22B, 22C, Statistics 32)	24
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)	10-11
English and/or rhetoric (see College requirement)	7
Meteorology (Atmospheric Science 60)	3-4
Depth Subject Matter	30
Atmospheric Science 110A, 110B, 120, 121A, and 121B	17
Upper division Atmospheric Science courses selected with adviser's approval.	13
If both courses 105 and 133 are taken, only 4 units may be counted. No more than 3 units of courses 192 and 199 may be counted.	
Breadth Subject Matter	28
Social sciences and humanities electives†	28
General education (see General Education requirement)	
Restricted Electives	21
Earth and planetary sciences (choose from Environmental Studies 116, 150A, 150B, Geography 116, 117, Geology 105, 113, 115, Resource Sciences 103, Soil Science 100, Water Science 100, 141, 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	30-31
Total Units for the Major	180

Major Adviser. R.H. Shaw (*Land, Air and Water Resources*).

Advising Center for the major, as well as for graduate studies, is located in 122 Hoagland Hall, Land, Air and Water Resources Teaching Center (752-1669).

Graduate Study. You can specialize in particular areas of atmospheric science through graduate study and research leading to the M.S. and Ph.D. degrees. For details see under the Graduate Group in Atmospheric Science. See also the Graduate Division section in this catalog.

Related Courses. See Civil Engineering 149B; Environmental Studies 150A; Geography 3, 115, 116; 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 Land, Air and Water Resources Teaching Center, 122 Hoagland Hall (752-1669).

Lower Division Courses

10. Severe and Unusual Weather (3) III. Weare, Soong, Carroll Lecture—2 hours; discussion—1 hour. Prerequisite: Physics 10, high school physics or the equivalent. Extreme or unusual

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

weather events, eg., floods, blizzards, hurricanes, tornadoes and desertification. Emphasis placed on scientific perspective and human context. Not intended for students majoring in the physical sciences. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Physics 10.

60. Introduction to Atmospheric Science (4) I, Myrup Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 21C and Physics 8A. Introduction to atmospheric sciences for students in the natural sciences and engineering. Application of laws of physics to the atmospheric system. Introduction to atmospheric radiation, thermodynamics and dynamics. Physical basis of modern 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 atmospheric science. Internship supervised by a member of the faculty. (P/NP grading only.)

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Upper Division Courses

105. Microclimate of Agricultural Systems (3) I, Paw U Lecture—3 hours. Prerequisite: upper division standing in biological or physical sciences. Intended for nonmajors. 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. Students who have completed course 133 may receive only one unit of credit.

110A. Weather Analysis and Forecasting (4) III. Soong Lecture—2 hours; laboratory—6 hours. Prerequisite: course 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 60 (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, Mathematics 22C, and Physics 8B. 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. The Staff Lecture—2 hours; laboratory—3 hours. Prerequisite: course 60 and Physics 8B. Modern meteorological instruments and their use in meteorological observations and measurements. Both standard and micrometeorological instruments are included.

128. Radiation and Satellite Meteorology (3) II. Weare Lecture—3 hours. Prerequisite: course 60; Physics 8C (may be taken concurrently); Mathematics 22B, 22C. Concepts of atmospheric radiation and the use of satellites in remote sensing. Emphasis on the modification of solar and infrared radiation by the atmosphere. Estimation from satellite data of atmospheric variables such as temperatures and winds.

133. Biometeorology (4) II. Paw U Lecture—3 hours; discussion—1 hour. Prerequisite: two courses in a biological discipline; Mathematics 16B. Atmospheric and biological interactions. Physical basis for plant, animal and human response and adaptation to short-

term and long-term meteorological events. Students who have completed course 105 may receive only two units of credit.

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, Soong 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. The Staff 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 courses 60, 110A-110B, 120, and 128. Credit not allowed to students having completed any two of these courses.

***210. Atmospheric Physics** (3) III. The Staff Lecture—3 hours. Prerequisite: course 121A. 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. Emphasis on recent theoretical work in dynamic meteorology. 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, and one course in fluid dynamics. Processes determining transport and diffusion of primary and secondary pollutants. Models of turbulence, of the atmospheric boundary layer and of mesoscale wind fields, as applicable to pollutant dispersion problems are examined. Offered in 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 pa-

rameters 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—Applied Science Engineering 115 or the equivalent computer programming experience; course 150 recommended. Dynamics of climatic variations. Global and zonal average energy balance models. Parameterizations of radiative transfer, convection, and ocean circulation. Introduction to primitive equation climate models. Offered in even-numbered years.

250. Meso-Scale Meteorology (3) II. Soong Lecture—3 hours. Prerequisite: graduate standing, course 150, a course in partial differential equations; or consent of instructor. The study of weather phenomena with horizontal spatial dimensions between 2.5 and 2500 kilometers. Methods of observational study and numerical modeling of the structure and temporal behavior of these weather systems. Offered in odd-numbered years.

270A-G. Topics in Atmospheric Science (1-3) I, II, III. The Staff Discussion—1-3 hours. Applications and concepts in (A) Meteorological Statistics; (B) Computer Modeling of the Atmosphere; (C) Design of Experiments and Field Studies in Meteorology; (D) Solar and Infrared Radiation in the Atmosphere; (E) Aerosol and Cloud Physics; (F) Atmospheric Chemistry; (G) General Meteorology.

290. Seminar (1) I, III. The Staff (Chairperson in charge) Seminar—1 hour. Prerequisite: graduate standing in Atmospheric Science or related field. Current developments in selected areas of atmospheric research. Topics will vary according to student and faculty interests. (S/U grading only.)

291A-D. Research Conference in Atmospheric Science (1) I, II, III. The Staff Discussion—1 hour. Review and discussion of current literature in: (A) Air Quality Meteorology; (B) Biometeorology; (C) Boundary Layer Meteorology; (D) Climate Dynamics. May be repeated up to a total of 5 units per segment. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Atmospheric Science (A Graduate Group)

John J. Carroll III, Ph.D., Chairperson of the Group (752-3245)

Group Office, 139 Hoagland Hall (752-1406)

Faculty. Includes eighteen 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, biometeorology, boundary-layer meteorology, climate dynamics, and mesoscale meteorology. The diverse and extensive backgrounds of the faculty allow opportunities for interdisciplinary training and research.

Preparation. The Group encourages applications from all interested students with backgrounds in the physical or natural sciences. Basic qualifications for students entering the Atmospheric Science graduate program include mathematics to the level of vector calculus and differential equations, and one year of college-level physics. Considerable flexibility may be allowed for students with high academic potential,

but it is expected that deficiencies in preparatory material and in key undergraduate atmospheric science courses be completed within the first year of graduate study.

Graduate Adviser. S.T. Soong (*Land, Air and Water Resources, 752-6151*).

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, 3202 Food and Agricultural Sciences Building (752-1300)

Faculty

Ursula K. Abbott, Ph.D., Professor
 Hans Abplanaip, Ph.D., Professor
 Ray E. Burger, Ph.D., Professor
 Ralph A. Ernst, Ph.D., Lecturer
 C. Richard Grau, Ph.D., Professor
 Annie J. King, Ph.D., Assistant Professor
 Kirk C. Klasing, 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., Lecturer

The Major Program

Avian Sciences is the study of birds and the ways in which they relate to and are useful to man. The major provides a balanced program if your interest is in birds—including the study of avian wildlife and their environments, production and marketing of domestic birds and eggs, 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 53-54

Avian sciences (Avian Sciences 11 or 13) 3-4
 Biological sciences (Biological Sciences 1, Microbiology 2, Animal Science 1, 2, Zoology 2, and/or Plant Science 10) 15
 Chemistry (Chemistry 1A, 1B, 8A, 8B) 16
 Mathematics (Mathematics 16A, 16B) 6
 Statistics (Statistics 13) 4
 Computing (Agricultural Science and Management 21) 3
 Physics (Physics 1A and 1B) 6

Depth Subject Matter 49
 Physiological chemistry or biochemistry (Physiological Sciences 101A-101B or Biochemistry 101A-101B) 6
 Genetics (Genetics 100) 4
 Nutrition (Avian Sciences 150-150L or Nutrition 110) 5
 Physiology (Physiology 110) 5
 Laboratory units in above listed subjects 4
 (Recommended courses include Animal Science 135, Avian Sciences 150L, Biochemistry 101L, Genetics 101L, or Physiology 110L)
 Specialized courses related to avian species 25

Breadth Subject Matter 24
 Written and oral expression (see College requirement) 8
 Social sciences and humanities electives† 16

Restricted Electives to supplement or expand depth subject matter courses 27

Unrestricted Electives‡ 26-27
Total Units for the Major 180

Major Adviser. W.W. Weathers.

Advising Center for the major is located in 3202 Food and Agricultural Sciences Building (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. See also the Graduate Division section in this catalog.

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.

Courses in Avian Sciences

Lower Division Courses

11. Applied Avian Biology (3) II. Vohra Lecture—3 hours. Survey of principles and practices involved in poultry production. Designed for students not specializing in avian sciences.

13. Birds, Humans, and the Environment (4) III. Wilson, Grau Lecture—2 hours; discussion—1 hour; laboratory—2 hours. Prerequisite: course in biology recommended. Relations among birds, humans and their environment. Emphasis on ecology; includes avian evolution and biology, flight, behavior, domestication, agriculture, folklore, art, pollution and conservation. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10.

14. Laboratory in Avian Sciences (1) II. Vohra Laboratory—3 hours; two Saturday field trips. Prerequisite: course 11 (may be taken concurrently), or 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)

†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.

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.

101. Patterns in Avian Biology (3) I. Weathers. Lecture—3 hours. Prerequisite: Zoology 2 or the equivalent. Patterns of reproduction, locomotion, foraging, growth and development, energetics, and temperature regulation exhibited by birds. Ecological and evolutionary adaptations and allometric analysis of life history traits.

102. Fertility and Hatchability (4) III. Abbott. Lecture—2 hours; discussion—1 hour; laboratory—3 hours; one field trip; report. Prerequisite: course 100, Genetics 100 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) III. Grau. Lecture—2 hours; discussion—1 hour. Prerequisite: upper division standing in a biological sciences major; course 100. Cage birds, as a unique set of birds, will be examined with respect to anatomy, behavior, breeding, physiology, nutrition, diseases, history, incubation, space and other environmental needs, and history of use by man. Relationships between poultry and cage bird business will be explored.

***120. Game Bird Production (3) I.** 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. Advanced Poultry Management (4) III. Ernst. Lecture—3 hours; discussion—1 hour. Prerequisite: course 100. Application of physiological principles to environmental management of poultry, including 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. Vohra, Grau. Lecture—3 hours. Prerequisite: Physiological Sciences 101B (may be taken concurrently), or Biochemistry 101B, 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) III. King. Laboratory—6 hours. Prerequisite: course 150. Feeding trials to show nutrient requirements. Metabolizable energy study and proximate analysis of feed. Determination of vitamins, minerals, fatty acids and other nutrients or substances in feed with emphasis on use of laboratory equipment.

190. Seminar in Avian Sciences (1) I, II, III. 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. (P/NP grading only.)

Graduate Courses

202L. Laboratory in Avian Experimental Embryology and Teratology (4) III. Abbott. Laboratory—twenty-nine consecutive 3½-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.

220. Cellular Proliferation and Oncogenes (4) III. Radke. Lecture—3 hours; term paper. Prerequisite: Biochemistry 101B, Zoology 121A-121B, Genetics 102B. Regulation of growth and division of animal cells. Oncogenes, retroviruses and growth factors will be discussed in the context of normal and cancerous growth. Critical reading and writing are stressed.

230. Avian Endocrinology (2) II. Millam. Lecture—2 hours. Prerequisite: coursework in endocrinology, avian biology or reproductive physiology advisable. Examination of current issues in avian endocrinology with emphasis on endocrine aspects of reproductive physiology. Offered in odd-numbered years.

250. Advanced Poultry Nutrition and Feed Formulation (3) II. Vohra, Klasing. Lecture—3 hours, including use of computer for least cost formulation. Prerequisite: Nutrition 115 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 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, 3202 Food and Agricultural Sciences Building (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. K.C. Klasing (*Avian Sciences*).

Bacteriology

See Microbiology

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 program focuses 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 di-

vision 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, 376 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 Microbiology 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 6A-6B-6C or 8A-8B-8C†	12
Depth Subject Matter	40
Biochemistry 101A-101B, 101L	12
Genetics 100	4
Organic chemistry: Chemistry 128A-128B-128C, 129A-129B-129C	15
Physical chemistry: Chemistry 107A-107B-108 or 110A-110B-110C	9
Breadth Subject Matter	32
<i>College of Agricultural and Environmental Sciences students:</i>	
English 1, 3, 20, or 103; plus 4 additional units from the above or from English 102, 104, Rhetoric and Communication 1, Comparative Literature 1, 2, 3, Philosophy 5 or 10	8
General Education requirement (see General Education section in this catalog), plus enough social science, English, language or humanities courses to total 24 units‡	24
<i>College of Letters and Science students:</i>	
Refer to the College section 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).	
Unrestricted Electives to bring total to 180 units	
Total Units for the Major	180

Major Adviser. L.R. Sprechman (*Biochemistry and Biophysics*), 132 Briggs Hall.

Advising Center for the major is located in 376 Mrak Hall (752-0410).

Graduate Study. See Biochemistry (A Graduate Group); and the Graduate Division section in this catalog.

Courses. See under Biochemistry and Biophysics.

Biochemistry (A Graduate Group)

William F. Benisek, 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. M.E. Dahmus (*Biochemistry and Biophysics*), E. Conn (*Biochemistry and Biophysics*), M.R. Villarejo (*Biochemistry and Biophysics*).

Courses in Biochemistry

Graduate Courses

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Biochemistry and Biophysics

(College of Agricultural and Environmental Sciences)

Don M. Carlson, Ph.D., Chairperson of the Department

Department Office, 149 Briggs Hall (752-3611)

Faculty

- Don M. Carlson, 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
- Ken Hilt, Ph.D., Visiting Lecturer
- Lloyd L. Ingraham, Ph.D., Professor Emeritus
- Eric B. Kmiec, Ph.D., Assistant Professor
- J. Clark Lagarias, Ph.D., Associate Professor
- Mark G. McNamee, Ph.D., Professor
- Irwin H. Segel, Ph.D., Professor
- Larry R. Sprechman, Ph.D., Lecturer
- Paul K. Stumpf, Ph.D., Professor Emeritus
- Merna R. Villarejo, Ph.D., Associate Professor

Major Programs and Graduate Study. See the major in Biochemistry and for graduate study see Biochemistry (A Graduate Group) and the Graduate Division section in this catalog.

Related Courses. See Food Science and Technology 210, 250, 250L.

Courses in Biochemistry and Biophysics

Questions pertaining to the following courses should be directed to the instructor.

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, Segel, Sprechman

Lecture—3 hours. Prerequisite: course 101A. Continuation of 101A.

101L. General Biochemistry Laboratory (6) I, II, III. Chaykin, Sprechman, McNamee, Hedrick, Criddle, Villarejo
Lecture—3 hours; laboratory—9 hours. Prerequisite: course 101B (may be taken concurrently); Chemistry 5. Introduction to laboratory methods and procedures employed in studying biochemical processes. Designed for students who need experience in the use of biochemical techniques as laboratory tools.

102L. Advanced Undergraduate Laboratory (4) III. Sprechman
Lecture—2 hours; laboratory—7 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; laboratory—3 hours. Prerequisite: course 101B; course 123 (concurrently). Laboratory procedures involved in separation and study of enzymes.

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: course 101B. Introduction to enzyme kinetics and receptor-ligand interactions with emphasis on metabolic regulation and data analysis. Topics include steady-state kinetics, patterns of feedback inhibition, control by enzyme activity, allosteric enzymes, multireactant systems, enzyme assays, and membrane transport.

143. Structure-Function Relations of Proteins (3) I, Criddle, Villarejo, Hedrick
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. Molecular Biology of Eukaryotic Cells (3) II. Dahmus
Lecture—3 hours. Prerequisite: course 101B and 101L; Genetics 100. Structure, expression and regulation of eukaryotic genes. Chromosome structure and replication; gene structure, transcription and RNA processing; protein synthesis and translational control; development, immune system and oncogenes.

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.)

194H. Biochemistry Honors (1-5) I, II, III. The Staff
Prerequisite: 4 units of course 199 with faculty director; senior standing; grade-point average of at least 3.25; consent of department. Honors project in Biochemistry. Laboratory research on a biochemical problem followed by presentation of the work in a written thesis and in a seminar. (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.)

†Physics 8D is optional. Students electing the Physics 8 sequence should elect Mathematics 21A-21B-21C and 22A-22B-22C.

‡Units earned in satisfaction of American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Graduate Courses

201A. Physical and Chemical Biochemistry (4) I, Lagarias, Benisek (Biological Chemistry) and Troy (Biological Chemistry)

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. Integration of Metabolism and Regulatory Phenomena (3) II. The Staff

Lecture—3 hours. Prerequisite: course 201A or consent of instructor. Regulatory phenomena that occur in control of metabolism; e.g., regulation at enzyme level; integration of metabolic pathways including homeostasis, hormonal influences, turnover of enzymes, comparative aspects of metabolism, regulation of amino acids and lipid metabolism in living systems. Offered in odd-numbered years.

201C. Molecular Biology (3) III. Hershey (Biological Chemistry), Dahmus, Doi, Bradbury (Biological Chemistry)

Lecture—3 hours. Prerequisite: course 201A. 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. Cellular Biochemistry (3) I. McNamee, Etzler, Troy (Biological Chemistry), Sciabeni (Medical Microbiology and Immunology), Traut (Biological Chemistry)

Lecture—3 hours. Prerequisite: course 201A. Structure and function of cell membranes and cell surface components with emphasis on biochemical principles involved in cell growth, cell development and cell-cell interactions. Biochemical aspects of some differentiated systems, such as the immune system.

202A-202B. Advanced Biochemical Methods (1-1) I-II. The Staff

Lecture—1 hour. Prerequisite: course 201A (may be taken concurrently), and 101L or the equivalent. Laboratory methods and procedures used in biochemical research.

202L. Advanced Biochemistry Laboratory (5) I, II, III. The Staff

Laboratory—15 hours. Prerequisite: course 201A (may be taken concurrently), and 101L or the equivalent. Two five-week assignments in biochemistry research laboratories. Individual research problems with emphasis on methodological/procedural experience and experimental design.

203. Carbohydrates (3) III.

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. Gene Expression (3) III. Kmiec

Lecture—3 hours. Prerequisite: course 153 or 201C. Examination of current working hypotheses on the mechanism of gene expression on transcription. Transcription factors, cis-acting elements and regulatory domains will be examined in detail with a special emphasis on eukaryotic systems.

205. Biochemical Mechanisms (3) II. The Staff

Lecture—3 hours. Prerequisite: course 101B or consent of instructor; Chemistry 110C, 131. Bond structures 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 201D. Advanced topics in membrane biochemistry with emphasis on the structure and function of membrane proteins and lipids. Offered in odd-numbered years.

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. The Staff

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.

250. Biochemical Literature (1) I, II, III. The Staff

Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Critical reading and evaluation of current biochemical literature. Selected papers will be presented and discussed in detail. (S/U grading only.)

270. Advanced Research Conference (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Prerequisite: course 201C or consent of instructor. Presentation and critical discussions of research activities of various members of local biochemical community; primarily designed for graduate students. (S/U grading only.)

291. Current Progress in Biochemistry (1) I, II, III. The Staff (Chairperson in charge)

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. (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)

Robert D. Grey, Ph.D., Dean of Biological Sciences

Merna R. Villarejo, Ph.D., Associate Dean

Division Office, 376 Mrak Hall (752-0410)

Faculty

Faculty includes members from departments of Animal Physiology, Biochemistry and Biophysics, Botany, Genetics, Microbiology and Zoology; and academic advisers for divisional majors and instructors of upper division courses in curricula of divisional majors.

Wiltraud J.C. Pfeiffer, Ph.D., Lecturer (*Biological Sciences, Microbiology*)

Programs of Study

The Division of Biological Sciences is an intercollege unit which coordinates the teaching and research of the departments of Animal Physiology, Biochemistry and Biophysics, Botany, Genetics, Microbiology, and Zoology. Four majors leading to an A.B. degree are offered in Biological Sciences, Botany, Microbiology, 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	42-49
Microbiology 2 (or 102), 3 (or 102L)	4-6
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 6A, 6B, 6C; a course in computer programming.	

Note: A course in computer programming may be acceptable toward satisfaction of the mathematics/statistics requirement with prior approval from the Dean.

Depth Subject Matter	36
Genetics 100	4
Restricted Electives	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 hyphen must be taken.

Course List for Group Requirement

- (a) *Organismal biology:* Microbiology 105, 182; Botany 102, 105, 108, 114, 118, 119; Entomology 101, 102, 103; Veterinary Microbiology 127, 128; Wildlife and Fisheries Biology 111, 120; Zoology 100, 105, 106, 112, 133, 136, 137.
- (b) *Population biology and ecology:* Anthropology 154A; Microbiology 120; Botany 117, 141; Entomology 104; Environmental Studies 100, 121; Genetics 105; Geology 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:* Microbiology 130A-130B; Botany 111A-111B; Physiology 110, 117; Plant Pathology 130; Zoology 142, 143.
- (e) *Biochemistry and cell biology:* Biochemistry 101A-101B; Botany/Zoology 130; Physiological Sciences 101A-101B; Physiology 100A-100B.

Total Units for the Major 78-85

Breadth Subject Matter

College of Letters and Science students:
Refer to the College section for a description of requirements to be completed in addition to the major.

Biological Sciences

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	66-73

Microbiology 2 (or 102), 3 (or 102L) 4-6
 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 6A-6B-6C 12
 Statistics 13 or 102 4
 Zoology 2-2L 6

Recommended: Chemistry 5, a course in computer programming.

Depth Subject Matter 45
 Biochemistry 101A-101B or Physiological Sciences 101A-101B 6-7
 Genetics 100 4
 Restricted Electives 34-35

- Upper division biological sciences courses to include:
 (1) a minimum of 2 units or 6 (quarter) hours of laboratory classes,
 (2) at least two courses 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*: Microbiology 105, 162; Botany 102, 105, 108, 114, 118, 119; Entomology 101, 102, 103; Veterinary Microbiology 127, 128; Wildlife and Fisheries Biology 111, 120; Zoology 100, 105, 106, 112, 133, 136, 137.
 (b) *Population biology and ecology*: Anthropology 154A; Microbiology 120; Botany 117, 141; Entomology 104; Environmental Studies 100, 121; Genetics 105; Geology 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*: Botany 111A-111B; Microbiology 130A-130B; Physiology 110, 117; Plant Pathology 130; Zoology 142, 143.
 (e) *Biochemistry and cell biology*: Biochemistry 122, 123, 133, 143, 153; Botany/Zoology 130; Genetics 102A; Medical Microbiology 107; Physiology 100A-100B; Veterinary Microbiology 126; Zoology 121A, 121B, 121C.

Total Units for the Major 111-118

Breadth Subject Matter

College of Agricultural and Environmental Sciences students 23
 English and related subjects 7
 Social sciences and/or humanities 16
 See also the College section for additional requirements.

College of Letters and Science students:

Refer to the College section 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 101, 102, 103, 104, 106, 109, 116, 119, 153; Geology 111A; Human Anatomy 101; Nematology 110; Wildlife and Fisheries Biology 110, 111, 120, 140, 151; Zoology 100, 105, 106, 112, 125, 133, 136, 137, 138, 139, 147, 148, 149, 155.
 (b) Microbiology: Microbiology—all upper division courses (excluding 190-199 courses); Botany 114, 118, 119; Entomology 156; Geology 111B; Medical Microbiology 107; Plant Pathology 120, 130; Veterinary Microbiology 126, 127, 128, 132.
 (c) Plant Biology: Botany 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; Vegetable Crops 105.

Note: Botany 114, 118, or 119 may be used for either microbiology or plant biology (not both). Microbiology 102 when taken in place of Microbiology 2 satisfies the lower division bacteriology lecture requirement and simultaneously counts as upper division units in the major and satisfies the Microbiology Area requirement for the A.B. degree and partially satisfies the Microbiology Area requirement for the B.S. degree. Similarly, Microbiology 102L when taken in place of Microbiology 3 satisfies the lower division laboratory requirement and simultaneously counts as upper division laboratory units in both major programs.

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
Genetics 100	4
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*: Microbiology 105; Botany 102, 105, 114; Zoology 100, 106, 112, 136, 137
 (b) *Ecology*: Anthropology 154A; Botany 101; Environmental Studies 100; 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 also the Teacher Education Program.

Bodega Marine Laboratory Program:

A full quarter of undergraduate course work in marine biology is available each Spring Quarter at the Bodega Marine Laboratory located in Bodega Bay, California. Course offerings include lecture and laboratory instruction in the developmental biology and physiological adaptation of marine organisms, a weekly colloquium and an intensive individual research experience under the direction of Laboratory faculty (Biological Sciences courses 120, 120P, 121, 121P, 123). The program is residential in nature with students housed on the Laboratory grounds. Participants are assessed a room and board fee in addition to standard campus registration and enrollment expenses.

Additional information on the Bodega Marine Laboratory Program is available from the Division Office.

Courses in Biological Sciences

Lower Division Courses

1. Principles of Biology (5) I. Thornton, Murphy, and Ketelapper (Botany); II. Pfeiffer (Biological Sciences, Microbiology), Pratt (Microbiology); III. ——— (Zoology)
 Lecture—4 hours; laboratory—3 hours. Prerequisite: Chemistry 1B (may be taken concurrently). Interdisciplinary course designed for majors in the biological sciences. 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, ———; II, Wheelis (Microbiology); III, Ketelapper (Botany)
 Lecture—3 hours; discussion—1 hour. Consideration of the main features and principles of biology, with emphasis on biological processes and special reference to evolution, heredity, and the bearing of biology on human life. Designed for students not specializing in biology. Not open for credit to those who have had course 1. General Education credit: Nature and Environment/Introductory.

19. Biology of Cancer (3) III. Pfeiffer (Biological Sciences, Microbiology)
 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. Offered in even-numbered years.

98. Directed Group Study (1-5) I, II, III. The Staff (Associate Dean in charge)
 Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

Upper Division Courses

***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 112-112L), microbiology (normally Microbiology 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.

120. Developmental Biology of Marine Invertebrates (4) III. Clark and Chang (Animal Science)
 Lecture—30 hours total; laboratory—30 hours total. Prerequisite: Zoology 100-100L, Biochemistry 101A-101B or Physiological Sciences 101A-101B, and course 123 concurrently. Phylogenetic patterns of reproduction and development among the marine invertebrates. Emphasis on both modern and classical approaches to understanding gametogenesis, gamete interaction and fertilization, cleavage, cell differentiation, morphogenesis, and larval development and metamorphosis. Course offered at Bodega Marine Laboratory.

120P. Developmental Biology of Marine Invertebrates/Advanced Laboratory Topics (4) III. Clark and Chang (Animal Science)
 Laboratory—120 hours total. Prerequisite: course 120 concurrently. Students pick a research topic for intense study. Research will be related to a topic covered in course 120 and will be conducted at the Bodega Marine Laboratory with close supervision of resident faculty.

121. Physiological Adaptation of Marine Organisms (4) III. Clegg and Crowe (Zoology)
 Lecture—30 hours total; laboratory—30 hours total. Pre-

requisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B, Physics 6A-6B-6C, and course 123 (concurrently). Physiological adaptation to the environment among organisms in marine and estuarine habitats. Course offered at Bodega Marine Laboratory.

121P. Physiological Adaptation of Marine Organisms/Advanced Laboratory Topics (4) III. Clegg and Crowe (Zoology) Laboratory—120 hours total. Prerequisite: course 121 concurrently. Students pick a research topic for intense study. Research will be related to a topic covered in course 121 and will be conducted at the Bodega Marine Laboratory with close supervision of resident faculty.

123. Undergraduate Colloquium in Marine Science (1) III. Clark (Animal Science) Seminar—1 hour. Prerequisite: enrolled student at the Bodega Marine Laboratory. Series of weekly seminars by recognized authorities in various disciplines of marine science from within and outside the UC system. Includes informal discussion with speaker. Course will be held at Bodega Marine Laboratory. (P/NP grading only.)

162. General Virology (see Microbiology 162)

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. 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; 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. Thornton (Botany) 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.)

Biomedical Engineering (A Graduate Group)

David F. Katz, Ph.D., Chairperson of the Group (752-1135 or 752-2504)

Group Office, 3078 Bainer Hall (Chemical Engineering), (752-2504/0400)

Faculty

Includes faculty members from the three colleges, 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., Professor (*Human Physiology*)

Mont Hubbard, Ph.D., Professor (*Mechanical Engineering*)

Maury L. Hull, Ph.D., Associate Professor (*Mechanical Engineering*)

David Katz, Ph.D., Professor (*Obstetrics and Gynecology, Chemical Engineering*)

R. Bruce Martin, M.D. Professor in Residence (*Orthopaedic Surgery*)

James F. Shackelford, Ph.D., Professor (*Materials Science and Engineering*)

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; Engineering 140, 142, 144; Engineering: Chemical 154A, 154B, 161, 253A, 253B, 253C, 263; Engineering: Civil 244; Engineering: Computer Science 30, 40, 168; Engineering: Electrical and Computer Science 161, 172, 176, 177; Engineering: Mechanical 171, 172, 176, 222, 276A, 276B; English 104; Human Physiology: 200, 260, 261, 285; Infectious Diseases 250; Mathematics 128A, 128B, 128C, 140; Physical Education 101, 115, 201A, 220, 226; Physiological Sciences 260; 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.

227. Research Techniques in Biomechanics (3) II. Williams Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor; Physical Education 115 recommended. Experimental techniques for biomechanical analysis of human movement are examined. Techniques include data acquisition and analysis by computer, force platform analysis, strength assessment, planar and three-dimensional cinematography, data reduction and smoothing, body segment parameter determination; electromyography; biomechanical modelling. (Same as Physical Education 227.)

***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 168 or the equivalent; must be able to perform at graduate level. To increase through examples, projects and discussions, understanding of the components of information systems, including hardware, software, economics and people, and to prepare students to apply this understanding in the solution of specific problems in the creation, design and implementation of information systems.

290. Seminar (1) I, II, III. Katz Seminar—1 hour. Seminar in biomedical engineering. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff

299. Research (1-12) I, II, III, IV. The Staff (S/U grading only.)

Biophysics (A Graduate Group)

Mark G. McNamee, Ph.D., Chairperson of the Group

Group Office, 2320 Storer Hall (752-7468)

Faculty

Includes faculty members from the Departments of Biochemistry and Biophysics, Chemistry, Physics, 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 emphasis is on molecular biophysics. The curriculum consists of certain core courses in biology, chemistry, and physics, followed by specialty courses related to research interests. Specific program requirements are decided upon by a curriculum committee consisting of a research supervisor, the graduate adviser, and a group member. The Committee meets to consider individual educational needs with the student.

Graduate Adviser. Y. Yeh (*Applied Science Engineering*).

Graduate Courses

200. Current Techniques in Biophysics (2) II. The Staff Lecture—2 hours. Prerequisite: graduate standing; Biochemistry 101A, Zoology 121A or the equivalent. Current techniques in biophysics research including diffraction, magnetic resonance spectroscopy, calorimetry, optical spectroscopy, and electrophysiology. (S/U grading only.)

200LA. Biophysics Laboratory (3) I, II, III. The Staff Laboratory—18 hours (5 weeks). Prerequisite: course 200 (may be taken concurrently). Laboratory assignment in the research laboratory of a Biophysics Graduate Group faculty member. Individual research problems with emphasis on methodological/procedural experience and experimental design.

200LB. Biophysics Laboratory (6) I, II, III. The Staff Laboratory—two 18-hour rotations (5 weeks each). Prerequisite: course 200 (may be taken concurrently). Two five-week laboratory assignments in the research laboratories of Biophysics Graduate Group faculty members. Individual research problems with emphasis on methodological/procedural experience and experimental design.

290C. Research Conference in Biophysics (1) I, II, III. The Staff (Chairperson in charge) Discussion—1 hour. Prerequisite: graduate standing in Biophysics and/or consent of instructor; course 299 concurrently. Presentation and discussion of faculty and graduate-student research in biophysics. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Botany

(College of Letters and Science)

Terence M. Murphy, Ph.D., Chairperson of the Department

Department Office, 143 Robbins Hall (752-0617)

Faculty

Fredrick T. Addicott, Ph.D., Professor Emeritus

Lars Anderson, Ph.D., Visiting Lecturer

Floyd M. Ashton, Ph.D., Professor Emeritus

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. Craits, Ph.D., LL.D., Professor Emeritus
 Herbert B. Currier, Ph.D., Professor Emeritus
 James A. Doyle, Ph.D., Professor (*Botany, Geology*)

Emanuel Epstein, Ph.D., Professor Emeritus
 (*Botany; Land, Air and Water Resources*)

²Richard H. Falk, Ph.D., Professor
 Ernest M. Gifford, Jr., Ph.D., Professor Emeritus
 John J. Harada, Ph.D., Assistant Professor
 Hendrik J. Ketellapper, Ph.D., Professor
 Donald W. Kyhos, Ph.D., Professor
 Norma J. Lang, Ph.D., Professor
 William J. Lucas, Ph.D., Professor
 Jack Major, Ph.D., Professor Emeritus
 Terence M. Murphy, Ph.D., Professor
 Robert F. Norris, Ph.D., Associate Professor
 Robert W. Percy, Ph.D., Professor
 Marcel Rejmanek, Ph.D., Assistant Professor
 Thomas L. Rost, Ph.D., Professor
 Maureen L. Stanton, Ph.D., Associate Professor
 Alan J. Stemler, Ph.D., Associate Professor
 C. Ralph Stocking, Ph.D., Professor Emeritus
 Steven M. Theg, Ph.D., Assistant Professor
 Robert M. Thornton, Ph.D., Senior Lecturer
 John M. Tucker, Ph.D., Professor Emeritus
 Larry Vanderhoef, Ph.D., Professor
 Grady L. Webster, Ph.D., Professor
 T. Elliott Weier, Ph.D., Professor Emeritus
 Kenneth Wells, Ph.D., Professor

The Major Programs

Study leading to the Bachelor of Arts or Bachelor of Science degrees in botany involves several basic sciences, including mathematics, chemistry, physics, biochemistry, and genetics, as well as intensive consideration of several specialized areas of plant biology: anatomy, cell and molecular biology, morphology, systematics, and plant evolution, physiology, ecology, phycology, mycology, and weed science.

Botanists may teach, conduct research, or hold administrative positions. They are employed by educational institutions, federal and state agencies such as the U.S. Department of Agriculture, the Forest Service, Environmental Protection Agency and private industry. Some botanists will have careers in the pharmaceutical, petroleum or chemical industries, seed companies, botanical gardens, plant nurseries or food companies. The developing field of plant biotechnology will offer challenging careers to botanically trained graduates, and many elect to continue study toward advanced degrees.

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 and should be selected by those interested in a less intensive program in science, but one which permits a basic introduction to plant biology. The Bachelor of Science degree is offered in both the College of Letters and Science and the College of Agricultural and Environmental Sciences and should be selected by those wishing a greater background in the fundamental sciences and in botany. There are two academic plans offered within the B.S. program.

Graduate Study. The Department is a nationally recognized center for research and graduate study in many areas of plant biology, including ecology and systematics, cell and developmental botany, and biophysics of plant functions. It is also a center

for the study of weed science (weed biology, weed control, and herbicide physiology). Graduate students study with faculty in the Department under the auspices of the following Graduate Groups: Botany, Plant Physiology, Genetics, Cell and Developmental Biology, Biochemistry, Biophysics, Ecology, and Microbiology. Refer to specific graduate groups in this section of the catalog.

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 Microbiology 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
Genetics 100	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	57-64
Biological Sciences 1	5
Botany 2	5
Chemistry 1A, 1B, 1C	15
Chemistry 8A-8B or 128A-128B-128C-129A	6-11
Physics 6A, 6B, 6C	12
Mathematics 16A, 16B	6
Zoology 2-2L; or Microbiology 2 or 102, 3; or Geology 3-3L	4-6
Statistics 13 or 102	4
Depth Subject Matter	47
Biochemistry 101A, 101B	6
Genetics 100	4
Botany 105, 108, 111A, 111B, 111L, 116, 117, 118, 119	37
Total Units for the Major	104-111

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-129	6-11
Mathematics 16A-16B-16C or 21A-21B-21C	9-12
Physics 6A-6B-6C or 8A-8B-8C	12
Statistics 13 or 102	4
Depth Subject Matter	50-53
Biochemistry 101A, 101B, 101L, 122	15
Botany 105, 111A, 111B, 111L	14
Genetics 100	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 30.

Certain substitutions, including courses in other departments, may be allowed on prior consultation with the botany major adviser.

Breadth Subject Matter

<i>College of Agricultural and Environmental Sciences students</i>	24
English and/or rhetoric	8
Social sciences and/or humanities	16

See also the College section for additional requirements.

College of Letters and Science students:

Refer to the College section for a description of requirements to be completed in addition to the major.

Major Advisers: R.M. Thornton (Master Adviser); K. Wells (for A.B. and B.S., Option I); J.J. Harada (B.S., Option II).

Minor Program Requirements:

	UNITS
Botany	23
To satisfy the requirements for a Botany minor, a student must complete Botany 2 (or equivalent introductory botany course)	5
Upper division units including at least one course from each of the four groups	18
(a) Structural botany: Botany 105, 114, 116, 118, 119, 130	
(b) Physiological botany: Botany 111A, 111B, Plant Science 102	
(c) Ecological botany: Botany 101, 117, 141, Zoology 149	
(d) Systematics and evolution: Botany 102, 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. Refer to the Academic Information section and the appropriate College section for Dean's Honors List information.

Teaching Credential Subject Representative. R. M. Thornton. See also the Teacher Education Program.

Graduate Study. Graduate programs leading to M.S. and Ph.D. degrees are offered in cytology, plant physiology, plant molecular biology, 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, Ketellapper, Kyhos; II, Barbour, Stemler; 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) II, Falk
 Lecture—3 hours; one weekend field trip (half-day); term paper. Ethnobotanical and ecological themes are emphasized

in examining our dependence on plants, the ecological roles of plants, and the development of botany as a contemporary science. Non-science majors are encouraged to enroll. General Education credit: Nature and Environment/Introductory.

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, Kyhos, Doyle 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 their component species to the environment. Recommended for non-majors. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Botany 10.

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 the equivalent in plant science. Survey of the flora of California, with emphasis on field recognition and identification of important vascular plant families and genera characterizing the major floristic regions. Lectures review the taxonomic diversity, evolutionary relationships, and geographical patterns of California flora.

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.

106. Plant Cell, Tissue and Organ Development (3) II. Rost Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: course 2. Current concepts of the development of plant cells, tissues and organs. Emphasis will be on structural aspects. Offered in odd-numbered years.

108. Systematic Botany of Flowering Plants (5) III. The Staff Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Laboratory and field studies of the characters and relationships of the principal families and orders of flowering plants. Principles of taxonomy. Practice in identification of species by means of keys.

111A. Introduction to Plant Physiology (3) I, Stemler, Lucas Lecture—3 hours. Prerequisite: course 2; Chemistry 8B (may be taken concurrently); Physics 6A, 6B, and 6C recommended. 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, respiration.

111B. Introduction to Plant Physiology (3) II. Thornton Lecture—3 hours. Prerequisite: course 2 and Chemistry 8B; course 111A and Biochemistry 101A recommended. Processes, dynamics, and control of growth and development. Metabolism.

111L. Introductory Plant Physiology Laboratory (3) III. Bonner Discussion—1 hour; laboratory—6 hours. Prerequisite: course 111B (may be taken concurrently). Introduction to basic experimental techniques and instrumentation used in the investigation of plant physiological processes such as water-solute absorption and their movement and utilization; translocation; transpiration; photosynthesis; respiration; growth; development and reproduction.

112A. Problems in Plant Physiology (1) I, Stemler, Lucas 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) II. Thornton Discussion—1 hour. Prerequisite: 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. Fungi, Algae and Bryophytes (5) III. Wells, Lang Lecture—3 hours; laboratory—6 hours. Prerequisite: course 2. Introduction to the morphology, taxonomy, evolution and physiology of the fungi, algae, liverworts, and mosses. Not open for credit to students who have completed course 118 or 119.

***115. Marine Botany** (10) Extra-session summer. 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. The Staff Lecture—2 hours; laboratory—6 hours. Prerequisite: course 2. Introduction to form, structure and evolutionary history of selected plants from major divisions; 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, Pearcey, Stanton Lecture—3 hours; field trips—three to five (Friday or weekend). Prerequisite: plant physiology (course 111B) and plant identification (course 102 or 108) strongly recommended. The study of interactions between plant populations or vegetation types and their environment. Special emphasis on California. Students taking course 117 may not receive credit for course 101.

118. Phycology (5) II. Lang Lecture—3 hours; laboratory—6 hours; one weekend field trip. Prerequisite: course 2. Comparative morphology, physiology and development of major divisions (including cyanobacteria) 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 Microbiology 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. Rejmanek Lecture—2 hours; laboratory—3 hours. Prerequisite: course 2. Origin and evolution, beneficial and harmful aspects, reproduction and dispersal, seed germination and dormancy, growth and development, ecology, interaction of weeds and crops, natural succession, and herbicide-induced succession. Laboratories will emphasize taxonomy of weeds and demonstrate principles discussed in lectures.

122. Action of Herbicides (3) III. The Staff 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.

125. Molecular Aspects of Plant Development (3) II. Murphy Lecture—3 hours. Prerequisite: course 2 and Biochemistry 101B or Genetics 102A or Botany 111A. Gene expression and gene structure and their influence on growth and differentiation of higher plant tissues.

130. Survey of Cell Biology (4) I, Leslie and staff; II, The Staff 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.)

***135. Mineral Nutrition of Plants** (4) III. The Staff 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 tox-

icities; genetic and ecological aspects of plant nutrition. (Same course as Plant Science 135.)

140. Paleobotany (4) III. Doyle Lecture—3 hours; laboratory—3 hours. Prerequisite: course 2. Introduction to plant fossil record, beginning with invasion of land in the Silurian, emphasizing origin and evolution of major groups and adaptations and changing composition and distribution of floras in relation to plate tectonics and climatic change.

141. Plant Geography (3) II. Webster Lecture—3 hours. Prerequisite: course 102, course 108, or the equivalent. Survey of the geographical distribution patterns of vegetation types and selected groups of vascular plants, with consideration of the environmental and historical factors that determine the patterns. Offered in odd-numbered years.

***150. Biology and Management of Freshwater Macrophytes** (3) I, Anderson Lecture—3 hours; two field trips. Prerequisite: course 2, Biological Sciences 1, and Chemistry 8B; course 111A or Water Science 122 recommended. Brief survey of common fresh water macrophytes, their reproductive modes, physiology, growth (photosynthesis, nutrient utilization), development (hormonal interactions), ecology and management. Offered in odd-numbered years.

***155. Anatomical and Cytological Methods** (4) III. The Staff Lecture—1 hour; discussion—1 hour; laboratory—6 hours. Prerequisite: course 2 or the equivalent introductory course in biology. 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. Pearcey 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. Pearcey 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. Lucas Lecture—3 hours. Prerequisite: course 111B; Chemistry 107A or consent of instructor. Cellular physiology, plant water relations, translocation and membrane transport.

205B. Advanced Plant Physiology (3) II. Castellano, Stemler 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. Lucas Laboratory—6 hours; term paper. Prerequisite: course 205A (may be taken concurrently). Laboratory procedures in plant

physiology. Experiments demonstrate the theory and practice of modern instrumentation, and are designed to illustrate subject matter of course 205A.

206B. Advanced Plant Physiology Laboratory (3) II. Castelfranco Laboratory—9 hours. Prerequisite: course 205B (may be taken concurrently); Biochemistry 101L. Laboratory procedures in plant physiology. Experiments selected to follow subject-matter sequence of course 205B.

206C. Advanced Plant Physiology Laboratory (3) 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.** The Staff 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.** Bonner Lecture—3 hours. Prerequisite: courses 205A, 205B, 205C; Physics 6C. Mechanisms and phenomena involved in the control of plant growth by light. Photoperiodism, photomorphogenesis, phototropism, and certain aspects of photosynthesis. Course offered in even-numbered years.

***220. Concepts of Plant Cell, Tissue and Organ Development (3) III.** Roet Discussion—1 hour; seminar—1 hour; term paper. Prerequisite: courses in plant anatomy and in physiology. Student-given seminar and discussion course on selected topics of plant cell, tissue and organ development. Offered in even-numbered years.

221. Special Topics in Plant Physiology (2) III. Castelfranco Discussion—1 hour; seminar—1 hour. Analysis in depth of recent advances in plant physiology. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures. May be repeated for credit. (S/U grading only.)

***222. Special Topics in Plant Morphology, Systematics, and Ecology (2) II.** Webster Seminar—2 hours. Analysis of recent advances in plant structure and evolution. Lectures and discussions by research specialists. Term paper integrating and analyzing lectures. May be repeated once for credit. (S/U grading only.) Offered in even-numbered years.

227. Plant Molecular Biology (4) III. Harada Lecture-discussion—4 hours. Prerequisite: course 2 and Genetics 102A-102B or Biochemistry 153. Molecular aspects of higher plant biology with emphasis on gene expression. Plant nuclear and organelle genome organization, gene structure, mechanisms of gene regulation, gene transfer, and special topics related to development and response to biological and environmental stimuli.

***228. Plant Molecular Biology Laboratory (4) II.** Harada, Bennett (Vegetable Crops) Lecture—1 hour; laboratory—10 hours. Prerequisite: Biochemistry 101L, a course in molecular genetics and consent of instructors; course 227 recommended. Research methods in plant molecular biology. Topics include analysis of gene expression, characterization of gene structure, and gene transfer technology. Emphasis will be placed on analysis of developmentally regulated gene expression.

231. Biological Electron Microscopy (1) III. Falk Lecture—1 hour. Prerequisite: consent of instructor. Introduction to biological microscopy. Areas covered are: electron optics, electron specimen interactions, and vacuum systems.

231L. Biological Electron Microscopy Laboratory (3) III. Falk Laboratory—9 hours. Prerequisite: consent of instructor, course 231 (may be taken concurrently). Introduction to biological electron microscopy. Areas covered are: specimen preparation and microscope operation. Limited enrollment.

240. Paleobotany and Angiosperm Evolution (4) I. Doyle Lecture—3 hours; laboratory—3 hours. Prerequisite: course 108, 118, 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. Offered in even-numbered years.

***243. Palynology (4) I.** Doyle Lecture—2 hours; laboratory—6 hours. Prerequisite: course 108, 118, 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. Offered in odd-numbered years.

***245. Pollination Ecology (4) II.** Webster, Thorp (Entomology) 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—botany, embryology, biochemistry, etc.—elucidate problems of taxonomic relationship, mainly of genera and higher categories.

256A. Experimental Plant Taxonomy (2) II. Kyhos Lecture—1 hour; laboratory—3 hours. Prerequisite: course 102; course 117 and Genetics 103 recommended. Application of experimental techniques to the elucidation of taxonomic problems and evolutionary relationships in higher plants. Offered in odd-numbered years.

256B. Experimental Plant Taxonomy (2) III. Kyhos Lecture—1 hour; laboratory—3 hours. Prerequisite: course 256A. Continuation of course 256A. Study of variation in natural populations in relation to taxonomy; the application of population sample analysis, cytogenetics, transplant studies, etc., to the solution of taxonomic problems and the clarification of relationships. Offered in odd-numbered years.

290. Seminar (1) I. Barbour; II, Vanderhoef; III, Stanton Seminar—1 hour. (S/U grading only.)

290C. Research Conference in Botany (1) I, II, III. The Staff Discussion—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and discussion by faculty and graduate students of research projects in botany. May be repeated for credit. (S/U grading only.)

291. Seminars in Botany (1) I. Castelfranco; II, Rejmanek; III, Theg 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)

Michael S. Reid, Ph.D., Chairperson of the Group
Group Office, 151 Robbins Hall (752-7094)

Faculty. Includes 84 faculty members from ten departments in the field of plant biology.

Graduate Study. The Graduate Group in Botany serves to direct and coordinate graduate studies for the M.S. and Ph.D. degree programs in botanical sciences. Specific program specializations include anatomy, biochemistry, cell biology, ecology, genetics, molecular biology, morphology, mycology, paleobotany, phycology, physiology, systematics and weed science. 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 related

discipline. Courses in the following areas are considered to be prerequisite to the advanced degrees in botany: plant morphology (including courses treating algae and/or fungi), anatomy, systematics, ecology, physiology, genetics, general chemistry, organic chemistry, biochemistry, general physics, calculus, and statistics. To some extent, deficiencies in these areas can be made up after admission into the graduate program. The Graduate Adviser and major professor will design, in consultation with the student, a program of advanced courses to meet individual academic needs.

Cantonese

See Asian American Studies

Cell and Developmental Biology (A Graduate Group)

David W. Deamer, Ph.D., Chairperson of the Group (752-2175)

Group Office, 2320 Storer Hall (752-2175)

Faculty. The group includes 26 faculty members from eleven departments in the College of Agricultural 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 core courses in cell biology or developmental biology. Specific programs of study are decided upon by an advisory committee chaired by the student's research adviser, and the choice of major core courses will reflect the student's primary research interest.

Preparation. Appropriate preparation is an undergraduate degree in a biological or physical science. Preparation should include a year of calculus, physics, general chemistry and organic chemistry, and introductory courses in statistics, biochemistry, genetics and biology.

Graduate Advisers. C.A. Erickson (*Zoology*), S. Meisel (*Human Anatomy*).

Courses in Cell and Developmental Biology

Graduate Courses

200. Current Techniques in Cell Biology (2) I. FitzGerald Lecture—2 hours. Current techniques used in cell biology research including microscopy, spectroscopy, electrophysiology, immunochemistry, histology, organelle isolation, calorimetry, tissue culture and gel electrophoresis. Lectures are presented by experts on each technique, with emphasis on pitfalls to avoid when using the technique. (S/U grading only.) (Same course as Zoology 200.)

200LA. Cell and Developmental Biology Laboratory (3) I, II, III. The Staff (Chairperson in charge) Laboratory—18 hours (one five-week assignment). Prerequisite: course 200 (may be taken concurrently). Assignment in research laboratory of a Cell and Developmental Biology graduate group member. Individual research problems with emphasis on methodological/procedural experience and experimental design. (Same course as Zoology 200LA.)

200LB. Cell and Developmental Biology Laboratory (6) I, II, III. The Staff (Chairperson in charge) Laboratory—18 hours (two five-week assignments). Prerequisite: course 200 (may be taken concurrently). Assign-

ments in research laboratories of Cell and Developmental Biology graduate group members. Individual research problems with emphasis on methodological/procedural experience and experimental design. May be repeated for credit. (Same course as Zoology 200LB.)

205. Cell Biology of the Cytoskeleton (2) III. Tablin, Aggeler
Lecture—1 hour and discussion 1/2 hour (course hours entered to run sequentially); student presents critical analysis of current journal article and submits written outline and reference list for that publication. (S/U grading only.) Even-numbered years only.

290. Current Topics in Cell and Developmental Biology (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Seminars presented by guest lecturers describing their research activities. May be repeated for credit. (S/U grading only.)

290C. Research Conference in Cell and Developmental Biology (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: graduate standing in Cell and Developmental Biology and/or consent of instructor; course 299 concurrently. Presentation and discussion of faculty and graduate-student research in cell and developmental biology. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Chemistry

(College of Letters and Science)

R. Bryan Miller, Ph.D., Chairperson of the Department

William H. Fink, 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 Emeritus
^{3,4}Alan L. Balch, Ph.D., Professor
Albert T. Bottini, Ph.D., Professor
Robert K. Brinton, Ph.D., Professor Emeritus
Joyce T. Doi, Ph.D., Associate Adjunct Professor
W. Ronald Fawcett, Ph.D., Professor
William H. Fink, Ph.D., Professor
Edwin C. Friedrich, Ph.D., Professor
Sevgi S. Friedrich, Ph.D., Lecturer
Hakon Hope, Cand. real., Professor
William M. Jackson, Ph.D., Professor
Susan M. Kauzlarich, Ph.D., Assistant Professor
Raymond M. Keefer, Ph.D., Professor Emeritus
Joel E. Keizer, Ph.D., Professor
Peter B. Kelly, Ph.D., Assistant Professor
Richard E. Kepner, Ph.D., Professor Emeritus
Mark J. Kurth, Ph.D., Associate Professor
Gerd N. LaMar, Ph.D., Professor
August H. Maki, Ph.D., Professor
³Donald A. McQuarrie, Ph.D., Professor
Claude F. Meares, Ph.D., Professor
R. Bryan Miller, Ph.D., Professor
W. Kenneth Musker, Ph.D., Professor
Krishnan P. Nambiar, Ph.D., Assistant Professor
Charles P. Nash, Ph.D., Professor
Edgar P. Painter, Ph.D., Professor Emeritus
Philip P. Power, Ph.D., Professor
Peter A. Rock, Ph.D., Professor
⁴Robert N. Rosenfeld, Ph.D., Associate Professor
¹Carl W. Schmid, Ph.D., Professor
Neil E. Schore, Ph.D., Professor
Kevin M. Smith, Ph.D., Professor
Leo H. Sommer, Ph.D., Professor Emeritus
James H. Swinehart, Ph.D., Professor
Dino S. Tinti, Ph.D., Professor
Nancy S. True, Ph.D., Associate Professor
David H. Volman, Ph.D., Professor Emeritus
Fred E. Wood, Ph.D., Lecturer
⁴George S. Zweifel, Sc.D., Professor

The Major Programs

The goal of a bachelor's program in chemistry is to give a broad introduction to the principles of the field and to provide enough of the factual knowledge so that the student may quickly learn the specific chemistry applicable to the field in which the student chooses to work. Two programs in chemistry are available, one leading to the Bachelor of Arts and the other to the Bachelor of Science. Students who are interested in chemistry as a profession would normally elect the program leading to the B.S. degree, which is accredited by the American Chemical Society. The curriculum leading to an A.B. degree offers a less intensive program in chemistry and is appropriate for a student with a strong interest in chemistry, but who also has another goal such as 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 6A-6B-6C	12
Mathematics 21A-21B-21C or 16A-16B-16C	9-12
Depth Subject Matter	36
Chemistry 110A, 110B, 110C, 124A, 126A, 128B, 128C, 129A, 129B	25
At least 11 additional upper division units in chemistry (except Chemistry 107A or 107B), biochemistry, or physics	11
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	47
Chemistry 110A, 110B, 110C, 111, 115, 124A, 124B or 124C, 128A, 128B, 128C, 129A, 129B, 129C	38
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	96-100

Major Advisers. T.L. Allen, A.T. Bottini, W.H. Fink, E.C. Friedrich, R.E. Kepner, C.W. Schmid, N.E. Schore, D.S. Tinti, F.E. Wood.

Honors and Honors Program. The honors program comprises 6 units of course 194H.

Graduate Study. The Department of Chemistry offers programs of study and research leading to the M.S. and Ph.D. degrees in Chemistry. Detailed in-

formation regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Chemistry. See also the Graduate Division section in this catalog.

Courses in Chemistry

Lower Division Courses

1A. General Chemistry (5) I, Rock, Wood, ———; II, S. Friedrich, Lamar, Tinti
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: high school chemistry and physics and good facility in algebra and geometry including logarithms and exponents recommended. Fundamental principles of chemistry. Chemical reactions and equations, periodic table, stoichiometry, gases, thermochemistry, atomic and molecular structure. General Education credit for non-GE course sequence (1A-1B) which will satisfy one GE course: Nature and Environment/Introductory. (CAN Chem Seq A)

1B. General Chemistry (5) II, ———, Kelly, ———; III, McQuarrie
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 1A or 4A. Continuation of course 1A. Liquids, colligative properties of solutions, chemical equilibria, acids and bases, oxidation-reduction reactions, thermodynamics, electrochemistry, introduction to qualitative analysis. General Education credit for non-GE course sequence (1A-1B) which will satisfy one GE course: Nature and Environment/Introductory. (CAN Chem Seq A)

1C. General Chemistry (5) I, Allen, Fink; III, Musker, Wood
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 1B or 4B. Continuation of course 1B. Chemical kinetics, bonding, chemistry of the main group elements, coordination chemistry, nuclear chemistry, application of principles of chemistry to qualitative analysis. (CAN Chem Seq A)

4A. General Chemistry (5) I. Maki
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Mathematics 21A (may be taken concurrently); high school chemistry and physics. Stoichiometry, the periodic table, chemical reactions and equations, physical properties and kinetic theory of gases, atomic and molecular structure and chemical bonding. Intended for students majoring in the physical sciences or engineering. Course sequence 4A-4B-4C is equivalent to sequence 1A-1B-1C-5.

4B. General Chemistry (5) II. Wood
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 4A. Continuation of course 4A. Chemical thermodynamics; the properties of liquids and solutions; quantitative treatment of chemical equilibria with applications to precipitation reactions; acid-base reactions, and oxidation-reduction reactions; elementary electrochemistry. Laboratory will emphasize quantitative wet-chemical techniques.

4C. General Chemistry (5) III. Allen
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 4B. Continuation of course 4B. Chemical kinetics, topics in systematic inorganic chemistry, the solid state, nuclear chemistry, introduction to organic chemistry and biochemistry. Laboratory will emphasize qualitative analysis and preparative techniques.

5. Quantitative Analysis (4) I, III. The Staff
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, Musker; II, E. Friedrich; III, Doi
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, Musker; III, ———
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, Swinehart
Lecture—4 hours. A survey of basic concepts and contemporary applications of chemistry. Designed for non-science majors and not as preparation for Chemistry 1A. Course not open to students who have had Chemistry 1A; but students with credit for course 10 may take Chemistry 1A for full credit. General Education credit: Nature and Environment/Introductory.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

107A. Physical Chemistry for the Life Sciences (3) I. Keizer,

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. Fink,

Lecture—3 hours. Prerequisite: course 107A or 110A. Continuation of course 107A. Electrochemistry and the thermodynamics of simple electrolyte solutions. Chemical rate processes. Introduction to spectroscopy, atomic and molecular structure, x-ray crystallography, radiation and nuclear chemistry, and to surface chemistry and colloidal systems. Considerations on bioirreversible processes.

108. Physical Chemistry of Macromolecules (3) III. 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. Nash, True; 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. Kelly; II, Allen

Lecture—3 hours. Prerequisite: course 110A. Atomic and molecular structure and spectra.

110C. Physical Chemistry: Kinetics (3) II. Rock; III, Fink
Lecture—3 hours. Prerequisite: course 110B. Statistical thermodynamics, kinetic theory of gases, and chemical kinetics.

111. Physical Chemistry: Methods and Applications (4) I. Hope; III, Tinti

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 110C (may be taken concurrently) or consent of instructor. Introduction to the physicochemical literature, errors and methods of data treatment, physical measurements, and the physical chemistry of solids and crystallography. Experiments from the following areas: thermochemistry/phase equilibrium, kinetics, electrochemistry/solution chemistry, and spectroscopy/structure.

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 emphasis on operational amplifiers. Laboratory focuses on trace analyses of samples having practical significance.

120. Physical Chemistry Laboratory: Advanced Methods (3) II. Hope

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 111 or 115. Design of experiments, experimental control and data acquisition using laboratory computers. Experiments are chosen from areas such as computers in chemistry, physical measurements on macromolecules, surface chemistry and heterogeneous catalysis. All students will be trained in scientific glassblowing.

121. Introduction to Molecular Structure and Spectra (4) III. LaMar

Lecture—4 hours. Prerequisite: course 110B. Modern theoretical and experimental methods used to study problems of molecular structure and bonding; emphasis on spectroscopic techniques.

124A. Inorganic Chemistry: Fundamentals (3) I. Kauzlarich
Lecture—3 hours. Prerequisite: course 1C or 4C. Symmetry, molecular geometry and structure, molecular orbital theory of bonding (polyatomic molecules and transition metals), solid state chemistry, energetics and spectroscopy of inorganic compounds.

124B. Inorganic Chemistry: Main Group Elements (3) II. Power
Lecture—3 hours. Prerequisite: course 124A. Synthesis, structure and reactivity of inorganic and heteroorganic molecules containing the main group elements.

124C. Inorganic Chemistry: d and f Block Elements (3) III. Swinehart

Lecture—3 hours. Prerequisite: course 124A. Synthesis, structure and reactivity of transition metal complexes, organometallic and bioinorganic chemistry, the lanthanides and actinides.

***126. Nuclear and Radiochemistry (3) I.**

Lecture—3 hours. Prerequisite: course 110B (may be taken concurrently with consent of instructor). Introduction to theory and experimental methods in nuclear and radiochemistry 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. Rosenfeld; II, Schore; III, E. Friedrich

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, Nambiar; III, Bottini
Lecture—3 hours. Prerequisite: course 128A or consent of instructor, course 129A strongly recommended; chemistry majors should enroll in course 129B concurrently. Continuation of course 128A with emphasis on aromatic and aliphatic substitution reactions, elimination reactions, and the chemistry of carbonyl compounds. Introduction to the application of spectroscopic methods to organic chemistry.

128C. Organic Chemistry (3) I. E. Friedrich; II, Miller; 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. S. Friedrich; II, _____; 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. _____; II, Doi; III, _____

Laboratory—6 hours. Prerequisite: courses 128B (may be taken concurrently) and 129A. Continuation of course 129A. Emphasis is on methods used for synthesis and isolation of organic compounds.

129C. Organic Chemistry Laboratory (2) I. Bottini; II, _____; III, Nambiar

Laboratory—6 hours. Prerequisite: courses 128C (may be taken concurrently) and 129B. Continuation of course 129B.

130. Qualitative Organic Chemistry (4) III. Miller

Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 5, 128C, 129C. Application of physical and chemical techniques to the qualitative identification of organic compounds.

131. Modern Methods of Organic Synthesis (3) II. Zweifel

Lecture—3 hours. Prerequisite: course 128C. Introduction to modern synthetic methodology in organic chemistry with emphasis on stereoselective reactions and application to multistep syntheses of organic molecules containing multifunctionality.

140. Synthetic Methods (4) III. Power

Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 124A, 128C, 129C. Integrated inorganic-organic course in the preparation, purification and characterization of multifunctional organic, organometallic, and transition metal compounds using a wide range of methods.

150. Chemistry of Natural Products (3) I. Smith
Lecture—3 hours. Prerequisite: course 128C. Chemistry of terpenes, steroids, acetogenins, and alkaloids; isolation, structure determination, biosynthesis, chemical transformations, and total synthesis.

194H. Undergraduate Research (2-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: course 110C (may be taken concurrently) and honors status. Original research and a written report of the investigation. Unit value to be determined by instructor supervising the research. (P/NP grading only.)

197. Projects in Chemical Education (1-4) I, II, III. The Staff (Chairperson in charge)

Discussion and/or laboratory. Prerequisite: consent of instructor. Participation may include development of laboratory experiments, lecture demonstrations, autotutorial modules or assistance with laboratory sessions. May be repeated for credit for a total of 12 units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics and physics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor based upon adequate preparation in chemistry, mathematics, and physics. (P/NP grading only.)

Graduate Courses

201. Basic Chemical Uses of Symmetry and Group Theory (2) I. Balch

Lecture—2 hours. Prerequisite: graduate standing in chemistry. Symmetry elements, operations and point group, molecular symmetry. Representations of groups. Applications to molecular orbitals and molecular vibrations.

205. Symmetry, Spectroscopy, and Structure (3) II.
Lecture—3 hours. Prerequisite: course 201 or the equivalent. Vibrational and rotational spectra; electronic spectra and photoelectron spectroscopy; magnetism; electron spin and nuclear quadrupole resonance spectroscopy; nuclear magnetic resonance spectroscopy; other spectroscopic methods.

210A. Quantum Chemistry: Introduction and Stationary-State Properties (3) I. Tinti

Lecture—3 hours. Prerequisite: course 110B and 110C or consent of instructor. Stationary-state quantum chemistry: postulates of quantum mechanics, simple solutions, central field problems and angular momenta, hydrogen atom, perturbation theory, variational theory, atoms and molecules.

210B. Quantum Chemistry: Time-Dependent Systems (3) II. Rosenfeld

Lecture—3 hours. Prerequisite: course 210A. Matrix mechanics and time-dependent quantum chemistry: Matrix formulation of quantum mechanics, Heisenberg representation, time-dependent perturbation theory, selection rules, density matrices, and miscellaneous molecular properties.

210C. Quantum Chemistry: Molecular Spectroscopy (3) III. True

Lecture—3 hours. Prerequisite: course 210B. Molecular spectroscopy: Born-Oppenheimer approximation, rotational, vibrational and electronic spectroscopy, spin systems, and molecular photophysics.

211A. Advanced Physical Chemistry: Statistical Thermodynamics (3) I. McQuarrie

Lecture—3 hours. Prerequisite: consent of instructor. Principles and applications of statistical mechanics; ensemble theory; statistical thermodynamics of gases, solids, liquids, electrolyte solutions and polymers; chemical equilibrium.

211B. Statistical Mechanics (3) III. Keizer, McQuarrie

Lecture—3 hours. Prerequisite: course 211A. Statistical mechanics of nonequilibrium systems, including the rigorous kinetic theory of gases, continuum mechanics transport in dense fluids, stochastic processes, brownian motion and linear response theory. Offered in odd-numbered years.

212. Chemical Dynamics (3) I. Rosenfeld

Lecture—3 hours. Prerequisite: consent of instructor. Introduction to modern concepts in chemical reaction dynamics for graduate students in chemistry. Emphasis will be placed on experimental techniques as well as emerging physical models for characterizing chemical reactivity at a microscopic level. Offered in odd-numbered years.

215. Theoretical and Computational Chemistry (3) III. Keizer, McQuarrie, Fink

Lecture—3 hours. Prerequisite: courses 211A and 210B or consent of instructor. Mathematics of wide utility in chemistry, computational methods for guidance or alternative to experiment, and modern formulations of chemical theory. Emphasis will vary in successive years. May be repeated for credit when topic differs. Offered in even-numbered years.

216. Magnetic Resonance Spectroscopy (3) II. Maki

Lecture—3 hours. Prerequisite: courses 210A, 210B (may be taken concurrently). Quantum mechanics of spin and orbital angular momentum, nuclear magnetic resonance, theory of chemical shift and multiplet structures, electron spin resonance, theory of g-tensor in organic and transition ions, spin Hamiltonians, nuclear quadrupole resonance, spin relaxation processes. Offered in odd-numbered years.

217. X-Ray Structure Determination (3) III. Hope

Lecture—3 hours. Prerequisite: consent of instructor. Introduction to x-ray structure determination; crystals, symmetry, diffraction geometry, sample preparation and handling, diffraction apparatus and data collection, methods of structure solution and refinement, presentation of results, text, tables and graphics, crystallographic literature.

218. Physical Principles of Macromolecular Structure (3) III. The Staff

Lecture—3 hours. Prerequisite: course 211A or the equivalent. Relationship of higher order macromolecular structure to subunit composition; equilibrium properties and macromolecular dynamics; physical-chemical determination of macromolecular structure. Offered in even-numbered years.

219. Spectroscopy of Organic Compounds (3) I, Kurth
Lecture—3 hours. Prerequisite: course 128C or the equivalent. Identification of organic compounds and investigation of stereochemical and reaction mechanism phenomena using spectroscopic methods—principally NMR, IR, and MS.

221A-H. Special Topics in Organic Chemistry (3) I, II, III. The Staff
Lecture—3 hours. Selected topics of current interest in organic chemistry. Topics will vary each time the course is offered, and in general will emphasize the research interests of the staff member giving the course.

226. Principles of Transition Metal Chemistry (3) I, Swinehart
Lecture—3 hours. Prerequisite: course 124A 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.

228A. Bioinorganic Chemistry (3) III. Swinehart
Lecture—3 hours. Prerequisite: course 226 or consent of instructor. Role of inorganic chemistry in the functioning of biological systems by identifying the functions of metal ions and main group compounds in biological systems and discussing the chemistry of model and isolated biological compounds. Offered every third year (next offering Spring 1991).

228B. Main Group Chemistry (3) III. Power
Lecture—3 hours. Prerequisite: course 226 or consent of instructor. Synthesis, physical properties, reactions and bonding of main group compounds. Discussions of concepts of electron deficiency, hypervalency, and non-classical bonding. Chemistry of the main group elements will be treated systematically. Offered every third year (next offering Spring 1990).

228C. Solid-State Chemistry (3) III. Kauzlarich
Lecture—3 hours. Prerequisite: courses 124A, 110B, 226, or the equivalent. Design and synthesis, structure and bonding of solid-state compounds; physical properties and characterization of solids; topics of current interest such as low-dimensional materials, inorganic polymers, materials for catalysis. Offered every third year (next offering Spring 1989).

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.

231. Organic Synthesis: Methods and Strategies (3) III. Kurth
Lecture—3 hours. Prerequisite: course 131 or the equivalent. Provides a broadly based discussion of current strategies in synthetic organic chemistry. Focus on methods for constructing carbon frameworks, controlling relative stereochemistry, and controlling absolute stereochemistry. Retrosynthetic strategies will be discussed throughout the lectures.

233. Physical-Organic Chemistry (3) II. Bottini
Lecture—3 hours. Prerequisite: courses 128A-128B-128C and 110A-110B-110C or the equivalent. Introduction to elementary concepts in physical-organic chemistry including the application of simple numerical techniques in characterizing and modeling organic reactions.

235. Organometallic Chemistry in Organic Synthesis (3) III. Schore, Zweifel
Lecture—3 hours. Prerequisite: course 128C. Current trends in use of organometallics for organic synthesis; preparations, properties, applications, and limitations of organometallic reagents derived from transition and/or main group metals.

236. Chemistry of Natural Products (3) II. Smith
Lecture—3 hours. Prerequisite: course 128C or the equivalent. Advanced treatment of chemistry of naturally occurring compounds isolated from a variety of sources. Topics will include isolation, structure determination, chemical transformations, total synthesis, biological activity, and biosynthesis. Biosynthetic origin will be used as a unifying theme.

237. Bioorganic Chemistry (3) I. Nambiar
Lecture—3 hours. Prerequisite: course 128C or the equivalent. Structure and function of biomolecules; molecular recognition; enzyme reaction mechanisms; design of suicide substrates for enzymes; enzyme engineering; design of artificial enzymes and application of enzymes in artificial synthesis. Offered in odd-numbered years.

240. Advanced Analytical Chemistry (3) I, Fawcett
Lecture—3 hours. Prerequisite: course 110A and 115 or the equivalent. Numerical treatment of experimental data; thermodynamics of electrolyte and non-electrolyte solutions; complex equilibria in aqueous and non-aqueous solutions; potentiometry and specific ion electrodes; mass transfer in liquid solutions; fundamentals of separation science, including column, gas and liquid chromatography.

241A-241B-241C-241D. Special Topics in Analytical Chemistry (3) III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Series of advanced, research-oriented, special-topics courses in analytical chemistry. Topics will vary each time course is offered.

290. Seminar (1) I, II, III. Lamar, Power, Smith
Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

293. Introduction to Chemistry Research (1) I. The Staff (Balch 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

(College of Letters and Science)

Adaljiza Sosa-Riddell, Ph.D., Program Director
Jesús Leyba, Program Coordinator

Program Office, Temporary Building 101/115
(752-2421/2492)

Committee in Charge

Angie C. Chabram, Ph.D. (*Chicano Studies, Spanish*)

Richard A. Figueroa, Ph.D. (*Education*)

Barbara J. Merino, Ph.D. (*Education*)

Manuel J. Neri (*Art*)

Beatriz Pesquera, Ph.D. (*Chicano Studies, Sociology*)

Vicki L. Ruiz, Ph.D., (*History*)

Fabián A. Samaniego, M.A. (*Spanish*)

¹Adaljiza Sosa-Riddell, Ph.D. (*Chicano Studies*)

Faculty

Angie C. Chabram, Ph.D., Assistant Professor
(*Chicano Studies, Spanish*)

Beatriz Pesquera, Ph.D., Assistant Professor
(*Chicano Studies, Sociology*)

²Adaljiza Sosa-Riddell, Ph.D., Lecturer S.O.E.

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 Chicano/Mexicano history and social sciences, but stresses in-depth knowledge of the Spanish language, linguistics, Chicano/Mexicano culture and literature. This curriculum is flexible enough to accommodate primary professional interests in bilingual education, community or social service, or advanced graduate and/or professional preparation. The *sociology* track combines traditional courses in sociology with substantive area courses that deal intensively with the Chicano/Mexicano experience. The sociology emphasis promotes a greater understanding of the social, political, and cultural life of Chicano/Mexicano 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.

Chicano (Mexican-American) Studies

A.B. Major Requirements:

	Humanities Emphasis	UNITS
Preparatory Subject Matter		12-42
Spanish 1, 2, 3; (or the equivalent)		0-18
Spanish 4 or 7A, 5 or 7B, 28		0-12
Linguistics 1		4
Chicano Studies 10		4
Chicano Studies 20		4

Depth Subject Matter	38-40
Sociology 110 or Spanish 124	4
Spanish 126, 129, 135	4
One course from Spanish 131, 132, 133	3-4
One course from Linguistics 115, 150 or Education 151	3-4
History 169A, 189B; 166A or 166B	12
Political Science 168	4

Total Units for the Major 50-82

Recommended Linguistics 115 and 150 (above), American Studies 45; Spanish 8A, 8B, 9 (for non-native speakers of Spanish); Sociology 124, 130; Anthropology 134, 140B, 141A; Spanish 108B, 132 and 133 (above), 300.

	Sociology Emphasis	UNITS
Preparatory Subject Matter		25-37
Chicano Studies 10		4
Chicano Studies 20		4
Spanish 4 or 7A, 5 or 7B, 28		0-12
Sociology 1, 46A, 46B		13
Linguistics 1		4

Depth Subject Matter	43
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: Linguistics 150, Spanish 126	
Group 3: Sociology 118, Agricultural Economics 150	
Group 4: Applied Behavioral Sciences 172, 178, Chicano Studies 101	

Total Units for the Major 68-80

Major Advisers. *Humanities Emphasis:* A.C. Chabram, V.L. Ruiz, A. Sosa-Riddell. *Sociology Emphasis:* B. Pesquera, A. Sosa-Riddell.

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 an additional 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.

Minor Program Requirements:

This interdepartmental minor provides the student with a general overview of Chicanos/Mexicanos in terms of the history, culture, political involvement and role in the society of the Southwestern United States.

	UNITS
Chicano (Mexican-American) Studies	23-24
Chicano Studies 10 or 20	4

History 169A or 169B	4
Sociology 110 or Spanish 124	4
Political Science 168	4
Two elective courses to be chosen from Chicano Studies 101, 102, Education 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.

20. Development of Chicano Culture and Literature (4) II. Chabram

Lecture—3 hours; discussion—1 hour. Knowledge of Spanish not required. Panoramic view of the development of Chicano cultural and literary forms from the 1940's to the present. Course explores how Chicano literary texts and other artistic forms reflect social, political, and cultural transformations.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

101. 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) II. Pesquera
Lecture—3 hours; term paper. Prerequisite: course 10 or Spanish 124 or History 169B. Analysis of the role and status of Chicanas in contemporary American society. Special emphasis is on their historical role, the political, economic and social institutions which have affected their status, and their contributions to society and their community.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: upper division standing and consent of Program Chairperson. (P/NP grading only.)

settings, or pursue further study leading to a doctorate in child development or related fields.

Graduate Adviser. J.N. Welker (*Applied Behavioral Sciences*).

Chinese

See Asian American Studies; Chinese and Japanese (below); and East Asian Studies

Chinese and Japanese

(College of Letters and Science)

Donald Gibbs, Ph.D., Program Director

Program Office (Anthropology), 328 Young Hall
(752-0745)

Committee in Charge

Donald Gibbs, Ph.D. (*Chinese and Japanese*)
Chia-ning Chang, Ph.D. (*Chinese and Japanese*)
Earl H. Kinmonth, Ph.D. (*History*)
Don C. Price, Ph.D. (*History*), Chairperson
Janet S. Shibamoto, Ph.D. (*Chinese and Japanese, Anthropology*)
Benjamin E. Wallacker, Ph.D. (*Chinese and Japanese*)

Faculty

Robert Borgen, Ph.D., Associate Professor
Chia-ning Chang, Ph.D., Assistant Professor
David Fahy, M.A., Lecturer
Donald Gibbs, Ph.D., Associate Professor
Jong S. Kim, B.A., Lecturer
Key H. Kim, Ph.D., Professor Emeritus
Yun-chen Li, M.A., Lecturer
Mau-sang Ng, Ph.D., Assistant Professor
Janet S. Shibamoto, Ph.D., Associate Professor
Benjamin E. Wallacker, Ph.D., Professor

Related Courses. See East Asian Studies course listing.

Minor Program. Available through consultation with an undergraduate adviser in Chinese and Japanese. Minors are in Chinese or Japanese.

Courses in Chinese

Lower Division Courses

1. Elementary Chinese (5) I, II.
Lecture—3 hours; recitation—3 hours. Introduction to Chinese grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Chinese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1A. Intensive Elementary Modern Chinese (10) II. The Staff
Lecture—5 hours; discussion—5 hours. Combines the work of courses 1 and 2 into a single quarter. Those who complete this course may go on to course 3.

2. Elementary Chinese (5) II, III.
Lecture—3 hours; recitation—3 hours. Prerequisite: course 1. Continuation of course 1 in the areas of grammar and basic language skills.

3. Elementary Chinese (5) III, LI.
Lecture—3 hours; recitation—3 hours. Prerequisite: course 2. Completion of grammar sequence and continuing practice of all language skills, continuation of course 2.

3A. Situational Chinese (2) I, III. The Staff
Discussion—2 hours. Prerequisite: course 3 (may be taken

concurrently). Instructor and students create a specific social situation and establish roles for student-participants. Using techniques of drama and substitution drills, students have greater opportunities to develop spoken skills than is possible in course 3.

4. Intermediate 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.

6A. Situational Chinese (2) I, III. The Staff
Discussion—2 hours. Prerequisite: course 6 (may be taken concurrently). Instructor and students create a specific social situation and establish roles for student-participants. Using techniques of drama and oral repetition, students develop spoken fluency and appropriateness of expression as skills requisite to internships and study in China.

10. Modern Chinese Literature (In English) (4) I. Gibbs
Lecture—3 hours; discussion—1 hour. Introductory course requiring no knowledge of Chinese language or history. Reading and discussion of short stories and novels and viewing of two films. Designed to convey a feeling for what China has experienced in the twentieth century.

11. Great Books of China (2) II. The Staff
Lecture—1 hour; discussion—1 hour. Selected readings in English translations. (P/NP grading only.)

Upper Division Courses

104. Twentieth-century Chinese Fiction (In English) (4) III. Ng

Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or a course in Chinese history recommended. English language survey of Chinese fiction as it evolved amidst the great historical, social and cultural changes of the twentieth-century. Thorough study of the most influential writers and genres.

105. Western Influences on Twentieth-century Chinese Literature (In English) (4) III. Ng

Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or History 9A recommended. Introduction of Western literary thought into modern China, the experimentation with Western literary forms and techniques, and the development of Marxism in contemporary literary writing. Offered in even-numbered years.

106. Chinese Poetry (In English) (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: History 9A or any course on traditional China recommended. Organized topically and chronologically, the lyric tradition is explored from the dawn of folk songs down to modern expressions of social protest. Topics include friendship, love, oppression, war, parting, death, ecstasy and beauty. All readings are in English.

107. Traditional Chinese Fiction (In English) (4) I, Ng

Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or a course in Chinese history. English-language course studying the dawn of Chinese fiction and its development down to modern times. Combines survey history with close reading of representative works such as *The Story of the Stone* and famous Ming-Qing short stories.

111. Modern Chinese Literature: Reading and Discussion (4) I, Gibbs

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or the equivalent. Short stories, newspaper articles, essays.

112. Modern Chinese Literature: Poetry and the Novel (4) II. Gibbs

Lecture—3 hours; discussion—1 hour. Prerequisite: course 111 or consent of instructor. Continuation of course 111, with emphasis on the reading of poetry and novels.

113. Modern Chinese Literature: Drama and Film (4) III. Gibbs

Lecture—3 hours; discussion—1 hour. Prerequisite: course 112 or consent of instructor. Continuation of course 112, with emphasis on the reading of film scripts and the viewing of feature films from China.

114. Introduction to Classical Chinese: Confucius (4) I, Gibbs and staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 6 or consent of instructor. Texts from the Confucian canon are read with the assistance of prepared word glossaries so that while learning to read classical Chinese, the students also experience the most influential books in the history of China in their original texts.

Child Development (A Graduate Group)

Rosemarie Kraft, Ph.D., Chairperson of the Group

Group Office, 125 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

115. Introduction to Classical Chinese: Mencius (4) II. Gibbs and staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 114. Continues course 114 by reading selections from the text of the Mencius.

116. Introduction to Classical Chinese: Narrative Styles (4) III. Gibbs and staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 115. Continues course 115 by reading selections from the Records of the Grand Historian and other early, influential works.

117. Intermediate Classical Chinese: Poetry (4) I. Wallacker
Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Readings from various periods and genres. Emphasis on developing language skills in reading traditional texts. May be repeated once for credit when content varies.

118. Intermediate Classical Chinese: Prose (4) II. Wallacker
Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Readings from various periods and genres. Emphasis on developing language skills in reading traditional texts. Includes essays, memorials, philosophical writings, treatises. May be repeated once for credit when content varies.

119. Intermediate Classical Chinese: History (4) III. Wallacker
Lecture—3 hours; discussion—1 hour. Prerequisite: consent of instructor. Readings from standard histories. Emphasis on developing language skills in reading traditional texts. May be repeated once for credit when content varies.

120. Advanced Chinese (4) I, II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 113 or consent of instructor. Selected readings from all genres to develop advanced skills in reading, writing, aural comprehension, and translation. May be repeated once for credit.

130. Readings in Traditional Chinese Fiction (4) II. Ng
Lecture—1 hour; discussion—3 hours. Prerequisite: course 112 or the equivalent; course 114 recommended. Close reading in Chinese of representative works from the Tang Dynasty (618-907) to modern times. May be repeated once for credit when content varies.

152. Topics in Modern Chinese Literature (in English) (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 10 or 104, or a course on modern Chinese history. Topics vary but may include women, traditional values, the literature of published diaries, urban values, hypocrisy, provincial literature, prejudice, sexuality, alienation, etc. Scope varies; may cross several genres or concentrate on just one. Offered in odd-numbered years.

192. Chinese Internship (1-12) I, II, III. The Staff
Internship—2-36 hours to be arranged. Prerequisite: upper division standing and consent of instructor. Work experience in the Chinese language, with analytical term paper on a topic approved by instructor. (P/NP grading only.)

Courses in Japanese

Lower Division Courses

1. Elementary Japanese (5) I, Kim, Sakakibara
Lecture—3 hours; recitation—3 hours. Introduction to Japanese grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Japanese 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

1A. Intensive Elementary Japanese (10) II. The Staff
Lecture—5 hours; discussion—5 hours. Combines the work of courses 1 and 2 into a single quarter. Those who complete this course may go on to course 3.

2. Elementary Japanese (5) II. Kim, Sakakibara
Lecture—3 hours; recitation—3 hours. Prerequisite: course 1. Continuation of course 1 in the areas of grammar and basic language skills.

3. Elementary Japanese (5) III. Kim, Sakakibara
Lecture—3 hours; recitation—3 hours. Prerequisite: course 2. Completion of grammar sequence and continuing practice of all language skills, continuation of course 2.

4. Intermediate Modern Japanese (4) I. The Staff
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. The Staff
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. The Staff
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.

10. Masterworks of Japanese Literature (in English) (3) III. Fahy
Lecture—2 hours; discussion—1 hour. Readings in English translation of the most influential Japanese literary works from earliest times to the modern period.

25. Japanese Language and Culture (in English) (4) II. Shibamoto
Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Linguistics 1 or Anthropology 4 recommended. Classification and communication of experience in Japanese culture; principles of language use in Japanese society. Speech levels and honorific language, language and gender, minority languages, literacy. Role of Japanese in artificial intelligence and computer science. Offered in odd-numbered years.

Upper Division Courses

***101. Literary-Style Japanese** (2) II. The Staff
Lecture—14 hours; term paper. Prerequisite: course 121. Reading from selected pre-World War II Japanese texts in the *bungobun* style. May be repeated for credit.

***111. Japanese Composition** (2) I. The Staff
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. The Staff
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. The Staff
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. The Staff
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.

124A. Spoken Japanese (2) I. The Staff
Discussion—2 hours. Prerequisite: course 6 or the equivalent. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

124B. Spoken Japanese (2) II. The Staff
Discussion—2 hours. Prerequisite: course 124A or consent of instructor. Continuation of course 124A. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

124C. Spoken Japanese (2) III. The Staff
Discussion—2 hours. Prerequisite: course 124B or consent of instructor. Continuation of course 124B. Training in spoken Japanese for students with a basic working knowledge of the language. (P/NP grading only.)

131. Readings in Modern Japanese Literature: 1920-1945 (4) I, Chang
Lecture—3 hours; discussion—1 hour. Prerequisite: course 123 or the equivalent. Fourth-year level reading of representative works of modern Japanese literature including short stories, novellas, diaries, memoirs, poetry and excerpts from novels and plays from 1920 through the militaristic era, to the end of the war years in 1945.

132. Readings in Modern Japanese Literature: 1945-1970 (4) II. Chang
Lecture—3 hours; discussion—1 hour. Prerequisite: course 123 or the equivalent. Continuation of course 131, but may be taken independently. Covers selected texts from the immediate post-war years beginning in 1945 down to 1970 and the post-war recovery.

133. Readings in Modern Japanese Literature: 1970 to Present (4) III. Chang
Lecture—3 hours; discussion—1 hour. Prerequisite: course 123 or the equivalent. Continuation of course 132, but may be taken independently. Covers selected texts from 1970 to the present. Offered in odd-numbered years.

134. Readings in the Humanities: The Pre-1945 Period (4) I, Chang
Lecture—3 hours; discussion—1 hour. Prerequisite: course 123 or the equivalent. Fourth-year level reading of authentic prewar writings on Japanese culture, history, philosophy, society, religion, politics, aesthetics and comparative culture by prominent critics, scholars and intellectuals. Offered in even-numbered years.

135. Readings in the Humanities: The Post-1945 Period (4) II. Chang
Lecture—3 hours; discussion—1 hour. Prerequisite: course 123 or the equivalent. Fourth-year level reading of authentic postwar writings on Japanese culture, history, philosophy, society, religion, politics, aesthetics and comparative culture by prominent critics, scholars and intellectuals. Offered in even-numbered years.

136. Readings in Newspapers and Magazines (4) III. Chang and staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 123 or the equivalent. Fourth-year level reading of newspaper and magazine reports, articles and editorials on domestic and international affairs relating to contemporary Japan. Offered in even-numbered years.

152. Topics in Modern Japanese Literature in Translation (4) II, III. The Staff
Lecture—3 hours; discussion—1 hour. Works in translation representing major trends in modern Japanese literature. Study of broad generic, theoretical and historical contexts in Japan. Analysis of structure and techniques. May be repeated once for credit.

161. Japanese Literature in Translation: The Early Period (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Introduction to history of early Japanese literature from the Nara to the end of the Heian period through a broad survey of the major literary genres such as lyric poetry, court dramas, prose narratives, poem-tales and classical Chinese writings.

162. Japanese Literature in Translation: The Pre-Modern Period (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Introduction to the major literary genres from the twelfth century to the second half of the nineteenth century including poetry, *renga*, military chronicles, *no* drama, Buddhist literature, *haiku*, *haibun*, *Kabuki bunraku* plays and Edo prose narratives.

163. Japanese Literature in Translation: The Modern Period (4) III. Chang
Lecture—3 hours; discussion—1 hour. Introduction to modern Japanese literature from the 1870's to the 1970's. Surveys representative literary works and ideas against the social and intellectual background of the Meiji, Taisho and Showa periods.

192. Japanese Internship (1-12) I, II, III. The Staff
Internship—3-36 hours to be arranged. Prerequisite: upper division standing and consent of instructor. Work experience in Japanese language, with analytical term paper on a topic approved by instructor. (P/NP grading only.)

Graduate Courses

201. Introduction to Classical Japanese (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 123 or the equivalent. Introduction to essential grammatical structure of classical Japanese using selections from classical Japanese prose and poetry.

202. Introduction to Classical Japanese (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 201. Readings of relatively easy texts of classical Japanese poetry and prose assisted by annotations written in modern Japanese.

203. Introduction to Classical Japanese (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 202. Readings of classical and pre-modern Japanese prose and poetry beginning with late Heian works and proceeding to Kamakura, Muromachi and later periods. Readings include plays, Edo narratives, classical Chinese text and early Meiji writings.

291. Seminar in Modern Japanese Literature: Major Writers (4) III. Chang
Seminar—4 hours. Prerequisite: any course from 131, 132, 133, 134, 135, or the equivalent. In-depth reading and critical analyses of major works by and critical literature on one or two prominent modern or contemporary writers such as Natsume Soseki, Mori Ogai, Shimazaki Tōson, Akutagawa Ryūnosuke, Tanizaki Junichiro, Abe Kobo and Oe Kenzaburo. Offered in even-numbered years.

Courses in Oriental Languages and Civilizations

Upper Division Course

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.)

Graduate Course

***201. Proseminar in Sinological Methods** (4) III. Wallacker Seminar—3 hours. Prerequisite: knowledge of classical Chinese. (S/U grading only.)

Classics

(College of Letters and Science)

^{2,3}David A. Traill, Ph.D., Program Director

Department Office (Spanish and Classics), 616
Sprout Hall (752-0835)

Faculty

Richard E. Grimm, Ph.D., Associate Professor
Lynn E. Roller, Ph.D., Associate Professor
Wesley E. Thompson, Ph.D., Professor
^{2,3}David A. Traill, Ph.D., Professor

The Major Programs

Classics, as a university discipline, can be defined broadly or narrowly; broadly, it is the study of all aspects of ancient Greek and Roman life; narrowly, it is the study of the Greek and Latin languages and their literatures. The Department offers three majors that reflect these different definitions of the subject: the Classical Civilization major offers a broad interdisciplinary approach to the world of the Greeks and Romans, while the Latin and Greek majors focus on language and literature.

Classics is a discipline that is at once demanding and rewarding. It takes imagination and considerable effort to develop a sympathetic understanding of the concerns and preoccupations of people who lived more than two thousand years ago. Moreover, the languages which provide the key to understanding these cultures require a sustained commitment. In return, study of the Greeks and Romans enables the classicist to gain a unique perspective on the full sweep of western civilization, for the influence of these peoples in most areas of human endeavor has been all-pervasive and continues to this day. Even students who complete only one or two quarters of Latin or Greek find that they have a much clearer understanding of English grammar and that their vocabulary has been considerably enlarged. These are significant and lasting benefits.

Career Opportunities. Majors in Classics can make direct use of their knowledge in careers in library science, museum work, or high school teaching, or by going on to divinity school. There is now an acute shortage of high school teachers of Latin nationwide. More generally, Classics is a highly regarded liberal arts degree that trains students to think critically about complex issues. These skills can be applied to any field. It is said that if you can succeed in Classics you can succeed in anything. It is a particularly good choice as a pre-law major—not because of the scattering of Latin phrases that survive in legal terminology but because of the meticulous attention to detail which the study of an ancient language requires and fosters. It is also a good tactical choice for a pre-medicine major since medical schools are seeking to diversify their student intake by giving preference to those with unusual degrees. For whatever reasons, all the undergraduate majors in Classics at Davis in the last sixteen years who have sought admission to law school or medical school have been accepted. Others have embarked

on promising careers in a wide variety of fields including computers, intelligence work, publishing, social work, and real estate.

Majors planning to go on to graduate work in Classics should bear in mind that professional classicists are expected to know both Greek and Latin and have reading competence in French and German.

Classical Civilization

A. B. Major Requirements:

	UNITS
Preparatory Subject Matter	21-24
Greek 1, 2, 3 or Latin 1, 2, 3 or the equivalent	15
Three courses from the following, including at least one from Group (a)	9
(a) Classics 17A, 17B, 17C, 20.	
(b) Classics 4A, 10.	
Depth Subject Matter	40
Three upper division courses in Latin or Greek	12
At least 28 units from the following, with or without emphasis in a single area, chosen in consultation with a major adviser	28
(a) <i>Language and Literature</i> : All upper division courses in Latin and Greek; Classics 140, 141, 142, 143	
(b) <i>History</i> : History 111A, 111B, 111C, 102A Religious Studies 102	
(c) <i>Art, Archaeology, and Drama</i> : Classics 174, 175, Art 154A, 154B, 155, Dramatic Art 156	
(d) <i>Philosophy and Political Theory</i> : Philosophy 143, 161, 162, Political Science 118A, Rhetoric and Communication 110	
Total Units for the Major	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	15
Latin 1, 2, 3 (or the equivalent)	15
Depth Subject Matter	36
Latin 121	5
At least 31 additional upper division units in Latin	31
Total Units for the Major	36-51

Major Advisers. D. A. Traill, L.E. Roller (Classical Civilization); W. E. Thompson (Greek); and R. E. Grimm (Latin).

The Minor Program

The Department offers minors in Greek and Latin for those wishing to follow a shorter but still formally recognized program of study in classics.

Minor Program Requirements:

	UNITS
Greek	21

Greek 3	5
Four upper division courses in Greek	16
UNITS	
Latin	21
Latin 3	5
Four upper division courses in Latin	16

Graduate Program

The Department offers a master's degree in Classics with emphasis on either Greek or Latin. The program is suitable for high school teachers seeking to improve their qualifications and for students wishing to prepare themselves for admission to one of the more competitive doctoral programs in Classics.

Teaching Credential Subject Representative. R. E. Grimm. See also 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. D.A. Traill.

Courses in Classics

Lower Division Courses

4A. Classical Civilization (3) I. The Staff
Lecture—3 hours. An introduction to the literature, art, and institutions of classical Greece. General Education credit: Civilization and Culture/Introductory.

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. Mediterranean Bronze Age Archaeology (3) I, Roller
Lecture—3 hours. Archaeological monuments of the Ancient Near East, including Egypt and Mesopotamia, and of Greece and Crete during the Bronze Age. Special emphasis on the Minoan and Mycenaean civilizations. General Education credit: Civilization and Culture/Introductory.

17B. Greek Archaeology (3) II, Roller
Lecture—3 hours. Archaeological monuments of Geometric, Archaic, and Classical Greece, with special emphasis on the development of cities and sanctuaries. General Education credit: Civilization and Culture/Introductory.

***17C. Later Greek and Roman Archaeology** (3) III, Roller
Lecture—3 hours. Archaeological monuments of the Greek world after the conquests of Alexander the Great, and the monuments of Rome and the Roman Empire. General Education credit: Civilization and Culture/Introductory.

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. General Education credit: Civilization and Culture/Introductory.

30. Greek and Latin Elements in English Vocabulary (3) II, Grimm
Lecture—3 hours. Knowledge of Latin and Greek not required. Elements of Greek and Latin vocabulary for increased understanding of English word formation and improved ability to understand and retain unfamiliar words. Emphasis on Greek and Latin elements but other languages not neglected.

***31. Greek and Latin Elements in Technical Vocabulary** (3) I, Traill
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.

Upper Division Courses

140. Homer and Ancient Epic (4) II, The Staff
Lecture—3 hours; term paper. Prerequisite: course 4A or 10 or Comparative Literature 1. Reading of Iliad, Odyssey, and Aeneid in English. Discussion of Homer's and Vergil's techniques of composition, the beliefs and values of their respective societies and the influence of Homer on Vergil. Offered in odd-numbered years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 4A or 10.

***141. Greek and Roman Comedy** (4) III, 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Classics 4A.

***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*.

143. Greek Tragedy (4) III, Grimm
Lecture—3 hours; term paper. Prerequisite: course 4A or 10. Reading in English of selected plays of Aeschylus, Sophocles and Euripides. Lectures on the development and influence of Athenian tragedy. Offered in even-numbered years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 4A or 10.

***174. Ancient Greek Sanctuaries** (4) III, Roller
Lecture-discussion—4 hours. Prerequisite: course 17B or consent of instructor. The history, cults, and monuments of Olympia, Delphi, and other sanctuaries. Student reports on major monuments. Offered in even-numbered years.

***175. Topography and Monuments of Ancient Athens** (4) III, Roller
Lecture-discussion—4 hours. Prerequisite: course 17A-17B or consent of instructor. The history of Athens as an urban center from the Bronze Age through the late Roman period. Student reports on major monuments with emphasis placed on restoration, chronology, and on the relating of documentary to excavational evidence. Offered in odd-numbered years.

197TC. Community Tutoring in Classical Languages (1-5) I, II, III, Grimm
Prerequisite: consent of instructor. Supervised instruction of Greek or Latin in nearby schools by qualified students in department. May be repeated for credit up to 5 units. (P/NP grading only.)

Graduate Courses

***201. Introduction to Classical Philology** (4) I, Thompson
Seminar—3 hours. Survey of major contemporary areas of classical scholarship with special attention devoted to current problems in literary and textual criticism.

***202. Homer** (4) III, The Staff
Seminar—3 hours. Readings in the *Iliad* and *Odyssey*: the origins and transmission of the poems.

***203. Vergil** (4) II, Grimm
Seminar—3 hours. Reading of selected books of the *Bucolics*, *Georgics*, and *Aeneid*. Emphasis will be placed on the study of 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 Callullus, Horace, or Propertius. May be repeated for credit.

***206. Greek Historiography** (4) III, Thompson
Seminar—3 hours. Development of historical writing in Greece. May be repeated for credit.

***207. Greek Drama** (4) II, Grimm
Seminar—3 hours. Literary and philological analysis of the plays of Euripides, Sophocles, or Aeschylus. May be repeated for credit.

Greek

Lower Division Courses

1. Elementary Greek (5) I, Grimm
Lecture—5 hours. Introduction to the basic grammar and vocabulary of Classical and New Testament Greek. Development of translation skills with emphasis on Greek-English. (Students who have successfully completed Greek 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Greek (5) II, Grimm
Lecture—5 hours. Prerequisite: course 1. Continuation of course 1.

2NT. Elementary New Testament Greek (1) II, The Staff
Lecture—1 hour. Prerequisite: course 2 (concurrently). Supplementary study of New Testament Greek.

3. Intermediate Greek (5) III, Grimm
Lecture—5 hours. Prerequisite: course 2. Continuation of course 2. Selected readings from Greek authors.

3NT. Elementary New Testament Greek (1) III, The Staff
Lecture—1 hour. Prerequisite: course 3 (concurrently). Supplementary study of New Testament Greek.

98. Directed Group Study (1-5) I, II, III, The Staff (Program Director in Charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Attic Orators (4) II, The Staff
Lecture—3 hours. Prerequisite: course 3.

101. Plato (4) I, Roller
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) I, Grimm
Recitation—3 hours; term paper. Prerequisite: course 3.

104. Menander (4) III, Thompson
Lecture—3 hours; term paper. Prerequisite: course 3.

***105. Demosthenes** (4) III, The Staff
Lecture—3 hours; term paper. Prerequisite: course 3.

***111. Sophocles** (4) III, Grimm
Lecture—3 hours. Prerequisite: course 103.

***112. Aristophanes** (4) III, Grimm
Lecture—3 hours. Prerequisite: course 103.

***113. Thucydides** (4) I, Thompson
Lecture—3 hours. Prerequisite: course 103.

***114. Lyric Poetry** (4) III, Thompson
Lecture—3 hours. Prerequisite: course 103.

***115. Aeschylus** (4) II, Grimm
Lecture—3 hours. Prerequisite: course 103.

***116. Herodotus** (4) I, Thompson
Lecture—3 hours. Prerequisite: course 103.

198. Directed Group Study (1-5) I, II, III, The Staff (Program Director in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, The Staff (Thompson in charge)
(P/NP grading only.)

Latin

Lower Division Courses

1. Elementary Latin (5) I, The Staff
Lecture—5 hours. Introduction to basic grammar and vocabulary and development of translation skills with emphasis on Latin to English. Students who have successfully completed Latin 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.

2. Elementary Latin (5) II, The Staff
Lecture—5 hours. Prerequisite: course 1. Continuation of course 1.

2X. Intensive Latin (10) III, The Staff
Lecture—10 hours. Prerequisite: course 1. Intensive course that covers the ground of courses 2 and 3 in a single quarter. Those who have completed course 2 may receive only 5 units for course 2X.

3. Intermediate Latin (5) III, The Staff
Lecture—5 hours. Prerequisite: course 2. Continuation of course 2. Selected readings from Latin authors.

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

Upper Division Courses

100. Ovid (4) I, Grimm
Lecture—3 hours; paper. Prerequisite: course 3. Translation and discussion of selected readings from the works of Ovid.

101. Livy (4) II, Thompson
Lecture—3 hours. Prerequisite: course 3.

***102. Roman Comedy** (5) I, Thompson
Lecture—4 hours; term paper. Prerequisite: course 3.

***103. Vergil: Aeneid** (4) I,
Lecture—3 hours. Prerequisite: course 3.

***104. Sallust** (4) I, Thompson
Lecture—3 hours. Prerequisite: course 3.

***105. Catullus** (4) I, Grimm
Lecture—3 hours. Prerequisite: course 3.

***106. Horace: Odes and Epodes** (4) I, Grimm
Lecture—3 hours. Prerequisite: course 3.

108. Horace: Satires and Epistles (4) I, The Staff
Lecture—3 hours. Prerequisite: course 3.

***109. Roman Elegy** (4) III, Grimm
Lecture—3 hours. Prerequisite: course 3.

***110. Caesar** (4) I, Traill
Lecture—3 hours; substantial paper. Prerequisite: course 3. Translation and discussion of selected readings from Caesar. Grammar review and introduction to Latin prose composition.

***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.

***112. Cicero: Political Writings** (4) II, Thompson
Recitation—3 hours; term paper. Prerequisite: course 3.

***114. Cicero: Philosophical Works** (4) II,
Lecture—3 hours. Prerequisite: course 3.

***115. Lucretius** (4) III, Grimm
Lecture—3 hours. Prerequisite: course 3.

***118. Vergil: Eclogues and Georgics.** (4) III,
Lecture—3 hours. Prerequisite: course 3.

***121. Prose Composition** (5) I, Traill
Lecture—4 hours; term paper.

125. Medieval Latin (4) III, Traill
Lecture—3 hours; term paper. Prerequisite: course 3 and two upper division courses in Latin. Selected readings from the Vulgate and various medieval authors provide an introduction to the developments in the Latin Language and literature from the fourth to the fifteenth centuries.

198. Directed Group Study (1-5) I, II, III, The Staff (Program Director in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, The Staff (Program Director in charge)
(P/NP grading only.)

Graduate Course

299. Research (1-12) I, II, III, The Staff (Program Director in charge)
(S/U grading only.)

Clinical Pathology

(School of Veterinary Medicine)

Donald E. Jasper, D.V.M., Ph.D., Chairperson of the Department

Department Office, 1319 Haring Hall (752-0153)

Faculty

James S. Cullor, B.S., Assistant Professor
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
Joseph G. Zinkl, D.V.M., Ph.D., Associate Professor

Part-Time Clinical Faculty

Robert M. DuFort, D.V.M., 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: Phys-

iology 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) III. Jain Lecture—2 hours. Prerequisite: course 101, Biochemistry 101A-101B, or consent of instructor. Metabolism, ultrastructure, kinetics, homeostasis, cytochemistry, and functions of different leukocytes; physiological, functional, histochemical and morphological changes in leukocytes in diseases; their role in inflammatory and immunologic processes. Offered in even-numbered years.

206. Immunohematology (2) III. Jain, MacKenzie (Medicine), Cullor

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.

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.)

housing and the spatial environment, (2) minority communities, (3) women's issues in the community, (4) community health and human services, (5) environmental issues, and (6) rural and agricultural issues.

Preparation. Applicants to this program can prepare themselves by enrolling for upper division courses in the social or behavioral sciences, e.g., anthropology, economics, sociology, psychology, cultural geography, or political science, and courses in community studies.

Graduate Advisers. D.J. Dingemans, I. Fujimoto, R.I. Rochin.

Community Health

See Medicine, School of

Community Nutrition

(College of Agricultural and Environmental Sciences)

The Major Program

Community Nutrition focuses on the behavioral, economic, and sociocultural factors that 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 sociocultural, 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	50-53
Microbiology with laboratory (Microbiology 2, 3)	4
Biology (Biological Sciences 1)	5
Chemistry, general and organic (Chemistry 1A, 1B, 6A, 8B)	16
Computer logic or programming (Agricultural Science and Management 21 or Sociology 40)	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)	7
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

Nutrition 110, 111, 112, 116A, 116B, 118, 119, 120	28
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

Psychology 1
Education 110 or Psychology 130
Psychology 112 or Human Development 100A or 100B
Psychology 115 or Human Development 100C
Psychology 108, 129, 145, 165, 168, 180A, 180B, 180C
Applied Behavioral Sciences 173, 177, 178
Consumer Science 100
Food Science and Technology 107, 117
Sociology 154
Anthropology 129, 130
Rhetoric and Communication 115

Economics and International Development Option

International Agricultural Development 10
Agronomy 21
Economics 1A, 1B
Mathematics 16A
Agricultural Economics 100A, 100B, 120 130, 141
International Agricultural Development 110A, 110B, 195
Economics 100, 101, 115A, 115B, 118, 123 130, 162
Consumer Science 100
Anthropology 122, 126
Sociology 170
Economics 151A
Environmental Studies 1, 165
Rhetoric and Communication 115

Sociocultural Option

Foreign language (10 units or the equivalent strongly recommended)
Anthropology 101, 126, 133, 135
Geography 170, 175
Afr-American Studies 100
Applied Behavioral Sciences 2
Rhetoric and Communication 115
Regional courses, choose 8 units from one of the following four areas (alternative courses may be selected in consultation with the adviser)

North America: Anthropology 141A, 141C, 176, Geography 121, History 169A, 169B, Sociology 143A, 143B

Central and South America: Geography 122A, 122B, History 161A, 161B, 162, 163A, 163B, 165, 166A, 166B, 168

Africa: Anthropology 140A, 140B, Geography 125A, 125B, History 115A, 115B, 115C

Asia: Anthropology 142, 147, 148, 149, Geography 124, 127, History 137A, 137B, 137C, 138, 190A, 190B, 190C, 191A, 191B, 193, 194A, 194B, 194C, 195

Additional Recommended Courses

Applied Behavioral Sciences 151, 152,
Community Health 101, 180, 180, 194, Nutrition 114, 116AL, 116BL, 117, 129, 190, 192, 199, 219, Pharmacology 101, Sociology 106

Unrestricted Electives

Total Units for Degree 180

Major Adviser. K.G. Dewey (*Nutrition*).

Advising Center for the major is located in 1151 Food and Agricultural Sciences Building (752-2512).

Internship. To fulfill the academic requirements for an internship in Dietetics, the following courses must be included: Economics 1B, Agricultural Economics 112, Food Service Management 120, 120L, 121, 122, 123, Applied Behavioral Sciences 173 or Education 110, Psychology 1. Consult the Advising Center prior to the first quarter of the junior year for information on procedures.

Clinical Psychology

See Medicine, School of

Communication

See Rhetoric and Communication

Community Development (A Graduate Group)

Marc Pilisuk, Ph.D., Chairperson of the Group
Group Office, 103 Academic Office Building-4 (Applied Behavioral Sciences), (752-4630 a.m. only)

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 as administrators, planners, or technicians with some emphasis upon rural, nonmetropolitan communities and human service organizations. Training in community development is also aimed at preparing an individual to work within government or non-profit organizations in the realm of social and economic change. There is opportunity available for specialization in: (1)

Graduate Study. For information on graduate study, see the Graduate Division section in this catalog.

Comparative Literature

(College of Letters and Science)

Robert M. Torrance, Ph.D., Program Director
Program Office, 922 Sproul Hall (752-9934)

Committee in Charge

Samuel G. Armistead, Ph.D. (*Comparative Literature, Spanish*)

³Ruby Cohn, Ph.D. (*Comparative Literature, Dramatic Art*)

Peter A. Dale, Ph.D. (*English*)

Gail Finney, Ph.D. (*Comparative Literature, German*)

Michele Hannoosh, Ph.D. (*Comparative Literature, French*)

²Roland W. Hoermann, Ph.D. (*Comparative Literature, German*)

Manfred Kusch, Ph.D. (*Comparative Literature, French*)

Kari Lokke, Ph.D. (*Comparative Literature, English*)

Robert M. Torrance, Ph.D. (*Comparative Literature*)

²Marian B. Ury, Ph.D. (*Comparative Literature*)

Faculty

Samuel G. Armistead, Ph.D., Professor
(*Comparative Literature, Spanish*)

Margaret Bedrosian, Ph.D., Lecturer

Marc Eli Blanchard, Agrégé de Lettres, Professor
(*French*)

³Ruby Cohn, Ph.D., Professor (*Comparative Literature; Dramatic Art*)

Peter A. Dale, Ph.D., Professor (*English*)

Gail Finney, Ph.D., Associate Professor

(*Comparative Literature, German*)

Michele Hannoosh, Ph.D., Assistant Professor

(*Comparative Literature, French*)

³Roland W. Hoermann, Ph.D., Professor

(*Comparative Literature, German*)

Manfred Kusch, Ph.D., Associate Professor

(*Comparative Literature, French*)

Kari Lokke, Ph.D., Assistant Professor

(*Comparative Literature, English*)

Donna K. Reed, Ph.D., Lecturer

Peter M. Schaeffer, Ph.D., Professor (*German*)

Robert M. Torrance, Ph.D., Professor

Marian B. Ury, Ph.D., Associate Professor

Allan B. Williamson, Ph.D., Professor (*English*)

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	52-92

Recommended

Art 10H; Dramatic Art 20; Classics 10; History 4A, 4B, 4C; Philosophy 21, 22, 23.

Major Adviser. Michele Hannoosh (*Comparative Literature, French*).

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 foreign 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 Major Adviser.

All Comparative Literature majors and minors must consult with their adviser, individually, at least once at the beginning and once at the end of each academic year.

Teaching Credential Subject Representative. Michele Hannoosh. See also the Teacher Education Program.

Graduate Study. Refer to Comparative Literature (A Graduate Group). See also the Graduate Division section in this catalog.

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*. General Education credit: Civilization and Culture/Introductory.

2. Great Books of Western Civilization: From Faith to Reason (4) I, II, III. Director in charge
Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. An introduction, through class discussion and frequent written assignments, to some of the great books of western civilization from Dante's *Inferno* to Swift's *Gulliver's Travels*. General Education credit: Civilization and Culture/Introductory.

3. Great Books of Western Civilization: The Modern Crisis (4) I, II, III. Director in charge
Lecture-discussion—4 hours. Prerequisite: completion of Subject A requirement. An introduction, through class discussion and frequent written assignments, to some of the great books of western civilization from Goethe's *Faust* to Beckett's *Waiting for Godot*. General Education credit: Civilization and Culture/Introductory.

***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) I, Reed
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. General Education credit: Civilization and Culture/Introductory.

6. Myths and Legends (3) III. 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. General Education credit: Civilization and Culture/Introductory.

7. Literature of Fantasy and the Supernatural (3) II. Hoermann
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. General Education credit: Civilization and Culture/Introductory.

8. Utopias and their Transformations (3) I. Reed
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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

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, Molière/Racine, Lessing/Schiller; (H) Goethe, Byron, Stendhal, Pushkin, Lermontov; (I) Hoffmann, Gogol, Poe, Hawthorne, Maupassant, Chekhov, Melville; (J) Flaubert, Twain, Turgeniev, Galdos, Ibsen; (K) Balzac, Dostoevski/Tolstoi, Hardy, Shaw, Strindberg; (L) Unamuno, Svevo, Conrad, Gide, Kafka, Faulkner; (M) Rilke/Yeats, Joyce/Woolf, Mann/Celine, Bulgakov/Tanzaki, O'Neill/Brecht, Lorca/Pirandello; (N) Camus/Sartre, 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 (3) III. Cohn

Lecture—3 hours. Prerequisite: Subject A or the equivalent. 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 American theater. Offered in odd-numbered years. General Education credit: Civilization and Culture/Introductory.

*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) II. The Staff

Lecture-discussion—3 hours; term paper. Examination of the changing relationship between the individual human being and his "natural" environment, whether cultivated or wild, as reflected in literary works from ancient times to the present by such authors as Hesiod, Virgil, Rousseau, Wordsworth, and Thoreau. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

53A. Literature of China and Japan (3) II. Ury

Lecture—2 hours; discussion—1 hour. Introduction to representative masterpieces of East Asia with readings from such works as *The Story of the Stone*, *The Peach Blossom Fan*, Tang 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. Reed

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 Brontë. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

140. Thematic and Structural Study of Literature (4) I, Han-noosh

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. Torrance

Lecture-discussion—3 hours; term paper. Exploration of literary theories with emphasis on specific objectives and possibilities of comparative literature. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

142. Critical Reading and Analysis (4) III. Williamson (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) III. 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 Western genres and study of native and Western critical traditions. General Education credit: Civilization and Culture/

Non-Introductory. Recommended GE prerequisite: any course from GE Literature Prerequisite List.

157. War and Peace in Literature (4) II. Hoermann

Lecture-discussion—3 hours; term papers. Prerequisite: course 1, 2, or 3, or consent of instructor. Through study of a few major works from Western and non-Western literature the course seeks to illuminate the way in which literature from Antiquity to the present has dealt with the antinomy peace/war through the ages. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

*158. The Detective Story as Literature (4) I. The Staff

Lecture—3 hours; term paper. Study of the origins, literary and social background, development and implications of the literature of detection in a comparative context.

*159A-G. Special Topics in Comparative Literature (4) 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. General Education credit 159C: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

*160A. The Modern Novel (4) II. Finney

Lecture-discussion—3 hours; term paper. The changing image of man and his world as seen in novels by such writers as Joyce, Proust, and Mann. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

160B. The Modern Drama (4) I, Cohn

Lecture-discussion—3 hours; term paper. Readings in representative authors such as Ibsen, Strindberg, Chekhov, Pirandello and Brecht. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

*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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

*161B. Comedy (4) II. Cohn

Lecture-discussion—3 hours; term paper. Comic attitudes towards life in literary works of different ages. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

163. Biography and Autobiography (4) III. Hoermann

Lecture-discussion—3 hours; term paper. Portrayals of a human life in biographies and/or autobiographies of different countries and ages. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

*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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

*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) III. Kusch

Lecture-discussion—3 hours; term paper. Readings in major authors such as Swift, Voltaire, Rousseau, Sterne, and Kant, with emphasis on philosophical ideas and literary forms.

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. General Education credit: Civilization and Culture/Non-Introductory.

Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

166B. The Novel (4) II. 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

*167. Comparative Study of Major Authors (4) I. The Staff

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, III. Lokke, Finney

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. General Education credit 168A: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

*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, Torrance

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, thematic, 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.

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.

298. Directed Group Study (1-5) I, II, III

Prerequisite: graduate standing. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Director in charge)

(S/U grading only.)

299D. Special Study for the Doctoral Dissertation (1-12) I, II, III.

(S/U grading only.)

Professional Courses

390. Teaching Comparative Literature in College (3) I. The Staff

Lecture—1 hour; discussion—2 hours. Methods of teaching Comparative Literature with specific application to the in-

introductory courses 1, 2, and 3, in relation to major cultural and social developments. Discussion also of ways to teach analytical writing. (S/U grading only.)

392. Teaching Internship in Comparative Literature (1) I, II, III. The Staff
Discussion—1 hour. Regular consultations between the student instructor teaching Comparative Literature courses and a supervisor. In-class evaluation of teaching. May be repeated for credit after consultation with supervisor. (S/U grading only.)

Comparative Literature (A Graduate Group)

Robert M. Torrance, Ph.D., Chairperson of the Group, (752-6095)

Group Office, 922 Sproul Hall (752-9934)

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 Plan II (see Graduate Division section in this catalog). Candidates for the M.A. combine study of Comparative Literature with study of two literatures (one of which may be English or American) in the original languages.. Ph.D. candidates, in addition to further research of a comparative nature, study three literatures (one of which may be English or American), 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 poetry, drama, or the novel; or any other special emphasis approved by the Graduate Adviser.

Preparation. For admission to the Program, M.A. candidates should have an undergraduate major in literature and reading ability in one foreign language. Ph.D. candidates should have an undergraduate major in literature and reading ability in two foreign languages. The Group requires three letters of recommendation and a sample of recent written work, and it is recommended that students submit their GRE scores.

Graduate Adviser. R. W. Hoermann (*Comparative Literature, German*).

Comparative Pathology (A Graduate Group)

Joseph G. Zinkl, D.V.M., 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 disease processes. The focus of the Group is on the study of the causes and nature of disease processes in animals and humans. Major emphasis is on the mechanisms responsible for the development of diseases at the population, organismal, cellular or subcellular level. To this study is brought a wide array of scientific disciplines so that students with divergent interests can be accommodated in programs designed for individual needs.

This program is primarily designed for students who have a professional medical degree, i.e., D.V.M.,

M.D., D.D.S. Students without a professional degree will not be considered unless they have a specially strong background in basic biomedical sciences.

Beyond core courses selected from disciplines such as anatomy, bacteriology, genetics, immunology, parasitology, pathology, physiology, and virology, course programs are intentionally very flexible. The goal is to specialize in one field of principal interest and attain competence in one or more related areas.

Graduate Adviser. D. L. Dungworth (*Pathology*).

Computers

See Engineering: Electrical and Computer Science

Computer Science

See Computer Science; Computer Science (A Graduate Group); Engineering: Computer Science; and Engineering: Electrical and Computer Science

Computer Science

(College of Letters and Science)

The Major Program

The Computer Science major is designed to prepare students for careers involving the design of computer systems and their application to science, industry and management. Students taking this major receive solid grounding in fundamentals of languages, operating systems, and the formal mathematical tools 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 provides opportunities for students to choose electives both in the College of Letters and Science and in the College of Engineering. The program will 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.

Computer Science

B.S. Major Requirements:

Preparatory Subject Matter	48
Computer Science Engineering 30 or 30H, 40 or 40H	8
Electrical and Computer Science Engineering 70 ..	4
Mathematics 21A-21B-21C, 22A-22B,	16
Statistics 32	3
One series from the following four	15
(a) Chemistry 1A-1B-1C	
(b) Chemistry 1A-1B and Biological Science 1	
(c) Chemistry 4A-4B-4C	
(d) Physics 8A-8B-8C and Mathematics 22C	
Depth Subject Matter	54
Computer science, core courses	25

Computer Science Engineering 100, 110, 120, 122, 140, 150, Electrical and Computer Science Engineering 171	
Computer science electives	14
Minimum of 14 units from Computer Science Engineering 142, 160, 165, 168, 170, 175, Electrical and Computer Science Engineering 176, 177, 182A- 182B	
Upper division mathematics	15
Minimum of 15 units of approved upper division courses in mathematics and/or statistics. Any upper division course in mathematics or statistics is approved for this requirement <i>except</i> the following:	
Mathematics 108 and any mathematics course numbered above 188	
Any statistics course numbered below 131 or above 188	

Total Units for the Major 102

Major Advisers. G. L. Fisher and R.A. Olsson (*Computer Science Engineering*).

Graduate Study. See the Graduate Division section in this catalog.

Computer 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. Consists primarily of faculty members from the Department of Electrical Engineering and Computer Science (which includes the Division of Computer Science), the Department of Engineering: Applied Science (Livermore), and other UCD departments.

Graduate Study. The Graduate Group in Computer Science offers programs of study leading to the M.S. and Ph.D. degrees in Computer Science. Research strengths lie in artificial intelligence, computer architecture, computer networks, computer systems design, database systems, graphics, programming languages, operating systems, performance evaluation, robotics, scientific computation, and software engineering.

Preparation. The normal preparation for the program is a bachelor's degree in either computer science or in a closely related major such as electrical engineering or mathematics with substantial course work in computer science. Applications are also considered from students with outstanding records in other disciplines. M.S. Students may either complete a thesis approved by the Dean of the Graduate Division or pass written examinations in three "areas of specialization" defined by the Graduate Group. Ph.D. candidates must pass preliminary written examinations in three of the following five areas of study: programming languages/compilers, operating systems, computer science theory, scientific computation, and architecture. The candidates must in addition pass a qualifying oral examination and complete a thesis demonstrating original research in an area approved by the Graduate Group.

Graduate Advisers. P. Linz, 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 Agricultural and Managerial Economics; and for graduate study, see the Graduate Division section in this catalog.

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, University House Annex.

Upper Division Courses

142. Personal Finance (3) I, 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

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.)

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 (Physics 10)	4
Computer logic or programming (Agricultural Science and Management 21)	3
Microbiology with laboratory (Microbiology 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 (Agricultural 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 104, 111, 128)	28
Human nutrition with laboratory (Nutrition 110, 111, 112 or 113)	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 6A-6B-6C.

Major Adviser. H.G. Schutz (*Textiles and Clothing*).

Advising Center for the major is located in 128 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 also the Graduate Division section in this catalog.

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.*)

Preparatory Subject Matter	60-61
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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 is a related major. For graduate study, see the Graduate Division section in this catalog.

See Consumer Economics, Food Science and Technology, Nutrition, and Textiles and Clothing.

Courses in Consumer Science

Questions pertaining to the following courses should be directed to the instructor or to the Division of Textiles and Clothing, 129 Everson Hall.

Lower Division Courses

47. Food Product Development Field Study (1) III. Schutz Discussion—three 2-hour sessions; field trip—2 days. To observe commercial aspects of the large-scale development, distribution and evaluation of food products intended for human consumption. Course given between Winter and Spring Quarters and considered a Spring course for preen-

rollment. Advance enrollment with instructor required. (P/NP grading only.)

92. Internship in Consumer Science (1-12) I, II, III. The Staff (Needles 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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: any introductory GE course in Psychology, Economics, or Sociology.

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) III. 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 (Needles 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 (Needles in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Needles in charge) (P/NP grading only.)

Graduate Courses

200. Consumer Research Methods (3) II. Schutz Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Topics will include consumer laboratory and field attitude research, consumer sampling, measurement techniques, scales and methods of analysis.

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) III. Grismer 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 6A 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. Garrett 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.

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

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Studer 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. Garrett
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.

196. Individual Projects (1-2) I, II, III. Studer
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 (Studer in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Studer in charge)
(P/NP grading only.)

Dance

See Physical Education

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 diverse 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, textiles in the landscape, interior design, handprinted 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 overflow courses, and requesting independent study, internship, or other similar courses.

Design

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	38-41
Design 1, 2, 3, 11, 12, 13	21
Oral and written expression (see College requirement)	7
One course from Art 1A, 1B, 1C or 1D	4
Two courses from American Studies 10, Anthropology 2, Geology 2, Mathematics 10, Psychology 1, Sociology 1, 25, Rhetoric and Communication 1, 3	7-9
Depth Subject Matter	60
Design history, select from Design 140, 142A, 142B, 143, 144	12
Design, selected with adviser's approval	12
Design, upper division courses	36
Breadth Subject Matter	32
Natural science	16
Social science	16
General Education units (see General Education Requirement)	
Restricted Electives	21
(Courses to be selected with approval of adviser.)	
Unrestricted Electives	27-29
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. J.C. Stabb (*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

1. Introduction to Design (3) I. The Staff (Stabb in charge)
Lecture—3 hours. To develop an awareness of twentieth-century design vocabulary. To familiarize student with design elements, materials, and principles.

2. Design Methodology (3) II. Laky
Lecture—3 hours. Prerequisite: course 1 recommended. Introduction to mental, visual, and sensory processes leading to creation of new forms, images, objects, and environments.

Emphasis will be on imagining, producing, evaluating, and communicating ideas in the visual and physical realm.

3. Design in Society

(3) III. Gotelli
Lecture—3 hours. Prerequisite: course 1 or 2. Discussion of place of the designed object in society and the economy, including relationship of design and technology; individual need, design, manufacture, sale, use and synchronic connections.

11. Drawing Studio (4) I. The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 1 must be taken concurrently; priority enrollment to Design majors. Drawing for the designer as an aid to perception and communication of ideas, objects, and plans. May be repeated once with a different instructor (course 1 is not repeated).

12. Media Studio (4) II. The Staff (Stabb in charge)
Studio—8 hours; field trip. Prerequisite: course 2 must be taken concurrently; priority enrollment to Design majors. Tools, materials, and techniques used in the designer's studio.

13. Photographic Media Studio (4) III. The Staff (Stabb in charge)
Studio—8 hours. Prerequisite: course 1 or 2; course 3 must be taken concurrently; priority enrollment to Design majors. Film and video tape for description, simulation, analytical research, and design development.

21. Drafting and Perspective (4) I, III. Olsen
Studio—8 hours. Prerequisite: course in drawing recommended. Creation of three-dimensional designs on two-dimensional surfaces.

22. Basic Imagery (4) I, Butler
Studio—8 hours. Prerequisite: courses 6, 11, 12. Presentation of the fundamentals of designed images, combining a theoretical perspective with practice using the components of visual literacy. Specific focus upon (1) abstract structure, (2) symbolism, and (3) representation.

23. Personal Adornment (4) I, Stabb
Studio—8 hours; field trip. Exploration of the human image altered through ornament and its relation to the human structure.

24. Hand Constructed Textiles (4) II. Laky
Studio—8 hours; one or two field trips. Prerequisite: courses 6, 11, 12. Contemporary approach to textile techniques of construction such as netting, plaiting, knotting and basketry.

25. Reproduction Graphics (4) II. The Staff (Stabb in charge)
Studio—8 hours; field trip. Prerequisite: courses 6, 11 or 12, and 13. Basic studio and photographic skills for the designer; continuous tone, line and halftone films, mechanical and four-color screen separations.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Thayer in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

121. Design Delineation (4) II. Olsen
Studio—8 hours; field trip. Prerequisite: courses 11, 12, and 21. Exploration of the process of delineation, including principles of perspective drawing, rapid visualization techniques (the quick sketch), rendering and graphic presentation methods.

124. Textile Structures (4) III. Laky
Studio—8 hours; field trip. Prerequisite: course 23 or 24. Art and science of hand building structures in flexible materials. Studying projects in experimental two- and three-dimensional forms with some emphasis on relationships to architecture, furniture and interiors.

125. Textiles in the Landscape (4) III. Shawcroft
Lecture—2 hours; studio—5 hours. Prerequisite: courses 21, 22, 24. Structuring organic and mathematical forms in textiles, working with the symbiotic relationship of these textiles and their immediate placement in the outdoor landscape.

126A. Visual Presentation: Visual Merchandising (4) I, Gotelli
Studio—8 hours; field trips. Prerequisite: course 11, 12 or consent of instructor. Principles and practice of visual communication of ideas through non-verbal presentations. The study of three-dimensional objects in a spatial context with an emphasis on visual merchandising.

126B. Visual Presentation: Exhibition Design (4) II. Gotelli
Studio—8 hours; field trips. Prerequisite: course 11, 12 or consent of instructor. Principles and practice of visual communication of ideas through non-verbal presentations. The study of three-dimensional objects in a spatial context with an emphasis on the museum and gallery environment.

130. Model Construction (4) II. Berteaux
Studio—8 hours; field trip. Prerequisite: course 21. Theory and visualization of design problems related to furniture, interiors, exteriors, and play ground equipment integrated in and expressed by construction and presentation of working models from drawings.

131. Layered Textiles (4) II, Rivers

Studio—8 hours; one or two field trips. Prerequisite: background in drawing, personal adornment and non-loom textiles recommended. Exploration of multi-pieced and multi-layered textiles: applique, patchwork, quilting, stump work. The individualized influences of materials and techniques on contemporary textiles.

132A. Loom-Constructed Textile Design (4) I, Shawcroft

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) II, Shawcroft

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. Visual Metaphor (4-4) II, III, Butler

Studio—8 hours. Prerequisite: courses 13, 22, 25. Study and practice of image generation and production with emphasis on clarity of visual expression, the perception and use of color, and visual composition in the three-dimensional context.

134. Environmental Design (4) I, III, 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, Olsen

Studio—8 hours; one or two field trips. Prerequisite: course 21; course 180A recommended. Development of furniture for interior and exterior spaces. Includes behavioral and physical requirements; cultural and historical expression; structural and aesthetic considerations.

140. History of Design (4) II, The Staff (Stabb in charge)

Lecture—4 hours. Prerequisite: Art 1A or the equivalent. Historical survey of the changing relationship of society to its practices and techniques of making and using tools and objects; technological changes, development of design terminology, consumer goods, hand workmanship and industrial design.

142A. World Textiles: Far East and Pacific (4) I, Rivers

Lecture—4 hours, field trip. Prerequisite: courses 132A, 132B, 160A, or 170A (concurrently) highly recommended; course 1, Art 1A, 1B, or 1C also recommended. Textile arts of Japan, China, Africa, India, Oceania, Indonesia, and the Pacific Islands with emphasis on the aesthetic and stylistic qualities of these cultures.

142B. World Textiles: Middle East, Europe and the Americas (4) III, Laky

Lecture—4 hours; two field trips. Prerequisite: course 1; a studio class highly recommended: course 24, 124, 131, 132A, 132B, 160A-160B-160C or 170A-170B-170C (concurrently). Study of concepts and methods significant in the historical, social, esthetic and stylistic development of the textile arts.

143. History of Costume Design (4) II, Stabb

Lecture—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 (Stabb in charge)

Lecture—4 hours. Prerequisite: course 140 and Art 1C or the equivalent. History of interior design in Europe and America from the classical period to modern times. Emphasis on the dwelling in its cultural setting and the development of the theory of modern interior design.

160A-160B-160C. Textile Design (4-4-4) I, II, III, Rivers

Studio—8 hours; one or two field trips. Prerequisite: courses 11 and 12 recommended. Exploration of the design and appreciation of hand printed textiles; emphasis on the unique qualities of the individual as producer.

170A-170B-170C. Costume Design (4-4-4) I-II-III, Stabb

Studio—8 hours; field trip. Prerequisite: courses 11 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, Olsen; II, Gotelli; III, Berteaux

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 (1) I, II, The Staff; III, Olsen (Stabb in charge)

Seminar—1 hours. Prerequisite: design major or consent

of instructor. Philosophies of design explored through discussion and presentation of research results. May be repeated three times for credit. (P/NP grading only.)

191A-D. Workshops in Design (4-12) I, II, III, The Staff (Stabb in charge)

Seminar—1 hour; studio or field experience—3 hours per unit (units determined by instructor and student); field trip. Prerequisite: course 11, 12; upper division standing and consent of instructor. Faculty initiated workshops featuring advanced studies and applications of original work in Design: (A) Costume; (B) Environment; (C) Graphics; (D) Textiles. Credit limited to 12 units in one section or a combination of sections. Letter grading by contract.

192. Internship (1-6) I, II, III summer. The Staff (Stabb in charge)

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.)

197T. Tutoring in Design (1-5) I, II, III, The Staff (Stabb in charge)

Discussion—3-15 hours. Prerequisite: upper division standing and consent of instructor. Leading of small discussion groups or studio meetings affiliated with one of the department's regular courses. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, The Staff (Thayer 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 (Thayer in charge)

(P/NP grading only.)

Development, Resource, and Consumer Economics

(College of Agricultural and Environmental Sciences)

The Major Program

The University has merged the Development, Resource, and Consumer Economics major with the Agricultural and Managerial Economics Major. Students interested in these subjects are advised to consider the Consumer Economics or the Agricultural Economics option of the Agricultural and Managerial Economics major. Those admitted into the Development, Resource, and Consumer major before June 30, 1988 will be allowed to complete the major under the requirements listed in the 1987-88 catalog.

Advising Center for major is located in University House Annex (752-6185).

Major Adviser. S.H. Sosnick (*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.

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	40
Written expression (English 1 or 3)	4
Oral expression (Rhetoric and Communication 1) ...	4
Statistics (Statistics 13)	4
Bacteriology with laboratory (Microbiology 2, 3)	4
Computer logic or programming (Agricultural Science and Management 21 or Computer Science Engineering 10)	3
Chemistry, general and organic (Chemistry 1A, 1B, 8A, 8B)	16
Biology (Biological Sciences 1)	5
Depth Subject Matter	64-66
Biochemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B)	6-7
Physiology (Physiology 110, 110L)	7
Food Science and Technology 100A, 100B, 101A, 101B	10
Nutrition 110, 111, 113, 116A, 116AL, 116B 116BL, 118, 190	24
Food Service Management 120, 120L, 121, 122, 123	14
Agricultural Economics 112	4
Breadth Subject Matter	17
Principles of economics (Economics 1A or 1B)	5
Sociology 1 or 3 or Anthropology 2	4-5
General psychology (Psychology 1)	4
Principles of learning or methods of teaching (Applied Behavioral Sciences 173 or Education 110 or 111)	4
Unrestricted Electives	57-59
Total Units for the Major	180

Major Adviser. F.J. Zeman (*Nutrition*).

Advising Center for the major is located in 1151 Food and Agricultural Sciences Building (752-2512).

Graduate Study. See the Graduate Division section in this catalog.

Dramatic Art

(College of Letters and Science)

Robert A. Fahrner, Ph.D., Chairperson of the Department

Department Office, 222 Dramatic Art Building (752-0888)

Faculty

Elizabeth Carlin, M.F.A., Assistant Professor
Ruby Cohn, Ph.D., Professor (*Dramatic Art, Comparative Literature*)

Everard d'Harmoncourt, Ph.D., Professor
Robert A. Fahrner, Ph.D., Professor
Ralph Fetterly, M.A., Assistant Professor
Harry C. Johnson, M.A., 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
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. R. Fetterly, 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 also the Teacher Education Program.

Graduate Study. The Department of Dramatic Art offers programs of study and research leading to the M.A., M.F.A. (acting, design, directing, or play writing), and Ph.D. (theatre research) degrees. Detailed information may be obtained by contacting the Graduate Adviser.

Graduate Adviser. W.E. Kleb.

Lower Division Courses

10. Introduction to Acting (3) I, II, III. The Staff
Lecture-discussion—4 hours. Fundamentals of movement, speech, theatre games, and improvisation. Selected reading and viewing of theatre productions intended for students not specializing in Dramatic Art.

15. The Art of the Cinema (4) I, III. d'Hamoncourt
Lecture—3 hours, laboratory—2 hours. The cinema as an art form, its relation to other arts, its evolution with emphasis on the significant modern contributions.

15L. Introduction to Filmmaking (2) III. d'Hamoncourt
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.

25. Technical Aspects of Dramatic Art (2) III. Fetterly
Lecture—1 hour; laboratory—2 hours. Understanding and appreciation of the technical principles of dramatic production; basic tools and materials, principles of scene construction; scene painting, costume construction, stage rigging, lighting and sound equipment and control systems.

27. Fundamentals of Playwriting and Directing (3) I, Kleb
Discussion—2 hours; workshop—2 hours; reading of selected texts in the theory of directing and playwriting. Prerequisite: consent of instructor. Exercises in conceiving and developing theatre pieces with emphasis upon the creative collaboration of playwright and director. Offered in odd-numbered years.

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)
Primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

115. Advanced Study of Major Film Makers (4) II. d'Hamoncourt
Lecture—3 hours; laboratory—2 hours. Prerequisite: course 15. Analysis of the contribution of some outstanding film creators. Study of diverse aesthetic theories of the cinema and their application to selected films. May be repeated for credit when different film creator studied.

121A. Advanced Acting (4) I, Johnson
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 21B and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources.

121B. Advanced Acting (4) II. The Staff
Lecture—2 hours; laboratory—4 hours. Prerequisite: course 121A and consent of instructor. Theory and practice of acting focusing on performance problems and the maximization of individual resources.

124A. Principles of Theatrical Design: Scenery (4) I, 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.

124D. Principles of Theatrical Design: Costume (4) II. Kress
Lecture-seminar—4 hours. Prerequisite: course 24 or consent of instructor. Source materials for theatrical costuming, selecting fabrics, elements of design, analysis of plays in terms of costume design, execution of designs for modern and period plays.

***126. Production Management** (3) II. Winn
Lecture—3 hours. Prerequisite: course 25. Theoretical study of backstage operation from audition through performance: techniques of stage management, technical direction, cueing procedures and audience control. Offered in even-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) III. Kleb
Lecture—4 hours. History and development of the American Musical as a unique theatrical form. Offered in odd-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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 4A or 4B.

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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 4A or 4B.

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) II. 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, d'Hamoncourt
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) I, 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; and 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) II. Winn Seminar—3 hours; laboratory—2 hours. Prerequisite: course 124C, a scenic design course, and consent of instructor. Design concepts, script/score analysis, color, composition and style. Projects presented in studio atmosphere. Also included: renderings, written analyses, and drafted plots. Offered in 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 applied 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. Krieb, 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, Krieb 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.

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)

Mark E. Grismer, Ph.D., Chairperson of the Group

Group Office, 113 Veihmeyer Hall (752-3243/0453)

Faculty

The Group consists of forty 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 science, 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 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 four of the courses, and a doctoral candidate is required to take all six courses (although not necessarily within the first year). Students will be exempted from courses in which they have already had previous training. In addition, each student is required to take Earth Sciences and Resources 200 in their first and second years.

Atmospheric processes: Atmospheric Science 200

Earth sciences and resources: Earth Sciences and Resources 201

Solid-earth geophysics: Earth Sciences and Resources 240

Geochemistry: Geology 215

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. T.A. Cahill (*Physics*), M.E. Grismer (*Land, Air and Water Resources*), K.L. Verosub (*Geology*).

Courses in Earth Sciences and Resources

Graduate Courses

200. Survey of Earth Sciences and Resources (2) I, Grismer Lecture—1 hour; discussion—1 hour; paper. Prerequisite: open to students in the Earth Sciences and Resources program. Introductory course exposes students to the diversity of sciences involved in the program. Students prepare a paper and presentation in their area of interest. May be repeated once for credit.

201. Earth Science and Resources (3) II. Moores (Geology) Seminar—3 hours. Prerequisite: Physics 8C, Mathematics 22C, Chemistry 4C or consent of instructor. Advanced survey of the earth's structure and processes. Internal structure and plate tectonics. Principles of mineralogy and petrology. Igneous, and metamorphic processes. Sedimentation and stratigraphy. Deformation and regional structure. Energy, ore and water resources. Graduate students in Geology may enroll only with consent of instructor.

240. Geophysics of the Earth (3) III. McClain (Geology) Lecture—3 hours. Prerequisite: course 201, 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)

Joyce K. Kallgren, Ph.D., Program Director
Program Office, 922 Sproul Hall (752-1219)

Committee in Charge

Mary H. Fong, Ph.D. (*Art History*)
Donald Gibbs, Ph.D. (*Chinese and Japanese*)
Gary G. Hamilton, Ph.D. (*Sociology*)
Joyce K. Kallgren, Ph.D. (*Political Science*)
^{2,4}Earl H. Kinmonth, Ph.D. (*History*)
Whalen W. Lai, Ph.D. (*Religious Studies*)
³Kwang-Ching Liu, Ph.D. (*History*)
²Don C. Price, Ph.D. (*History*)
Janet S. Shibamoto, Ph.D. (*Chinese and Japanese*)
Benjamin E. Wallacker, Ph.D. (*Chinese and Japanese*)

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 East Asian 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, East Asian languages) within the major, to be chosen in consultation with their adviser.

Since six quarters of language work are required, students normally should apply no later than 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, Religious Studies 4, 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)	27
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	20
Agricultural Economics 125;	
Anthropology 110, 111, 112, 120, 122, 123, 124, 128, 190, 191; Art 163A, 163B, 164; Chinese 111, 117;	
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;	
Linguistics 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.)	

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 (*Chinese and Japanese*), D.C. Price (*History*); Japan: Janet Shibamoto (*Chinese and Japanese*).

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	148. Cultures of China and Korea
	149. 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
Chinese	1-2-3. Elementary Modern Chinese
	4,5,6. Intermediate Modern Chinese
	111. Modern Chinese Literature: Reading and Discussion
	117. Intermediate Classical Chinese: Poetry
Comparative Literature	53A. Literature of China and Japan
Economics	171. Economy of East Asia
Geography	127. Contemporary East Asia
History	9A. History of East Asian Civilization (China)
	9B. History of East Asian Civilization (Japan)
	90A. Modernization of China
	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
Linguistics	100. Languages of Eastern Asia
Political Science	133. The American Role in East Asia
	138. International Relations: East Asia
	148A. Government and Politics in East Asia:China
	148B. Government and Politics in East Asia:Pacific Rim
Religious Studies	70. Introduction to Buddhism
	172. Ch'an (Zen) Buddhism
Sociology	147. Sociological Perspectives on East Asia

Courses in East Asian Studies

Upper Division Courses

113. *Cinema and Society in China* (4) III. Gibbs
Lecture—3 hours; discussion—1 hour. Prerequisite: one

course from course 1, History 190C, 193, or consent of instructor. Knowledge of Chinese not required. Viewing and analysis of one Chinese film with English subtitles each week, followed by discussion and short essays. Cinematic technique, social values and film topics from 1930's to today. Not open for credit to students who have completed Chinese 113.

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

Ecology (A Graduate Group)

Theodore C. Foin, Ph.D., Chairperson of the Group

Group Office, 3122 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. Applicants to the biological and physical-chemical options will normally be expected to have completed two courses each in introductory biology, general chemistry, physics, mathematics, and statistics. Applicants to the human ecology option may substitute quantitative social science courses for up to two courses of chemistry or physics. Each of the three broad areas requires certain advanced preparation appropriate to the option.

Breadth Requirement. All degree candidates are required to select an upper division course from each of the following three study options. Recommended:

- Biological Ecology courses: Environmental Studies 100 (general ecology), Zoology 125 (animal ecology), Entomology 104 (insect ecology and behavior), or Botany 117 (plant ecology).
- Human Ecology courses: Environmental Studies/Anthropology 101 (principles of human ecology), Environmental Studies/Anthropology 133 (cultural ecology), Anthropology 152 (human evolution and fossil man), Geography 170 (cultural ecology), or Sociology 170 (population).
- 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 ecotoxicology).

Graduate Adviser. T.C. Foin.

Related Courses. Many departments offer such courses. A list of these courses is available at the Group Office.

Courses in Ecology

Graduate Courses

203. *Physiological Ecology of Animals* (2) III. Patterson
Lecture—1 hour; discussion—1 hour. Prerequisite: Zoology 125 or Physiology 110 or the equivalent; elementary calculus. Comparative examination of several animal groups addressing fundamental physiological mechanisms that shape the ecology of the animal group.

204. *Population and Community Ecology* (4) I, Schoener, Salt (Zoology), Toft
Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 100 or Zoology 125, Mathematics 21A-21B, or consent of instructor; Mathematics 22B strongly recommended. Review of major theoretical concepts of

population and community ecology, with emphasis on both the rationale of the theory and its correspondence to natural phenomena.

205. Structure of Ecological Communities (4) II. Quinn (Environmental Studies)

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies 100 or Zoology 125 or Botany 117, Genetics 103 or Botany 100 or Zoology 148, and Mathematics 21A-21B; Ecology 204 and Mathematics 22A-22B strongly recommended. Provides entry-level graduate students and advanced undergraduates an introduction to literature and contemporary research into processes structuring ecological communities. Particular emphasis placed on ecological phenomena with a significant spatial component, e.g., gene flow, colonization, and extinction.

206. Concepts and Methods in Plant Community Ecology (4) I. Barbour (Botany), Menke (Agronomy and Range Science), Rejmanek (Botany)

Lecture—3 hours; laboratory—4 hours. Prerequisite: introductory courses in statistics and plant ecology; consent of instructor. Principles and techniques of vegetation analysis, including structure, composition, and dynamics. Emphasis given to sampling procedures, association analysis, ordination, processes and mechanisms of succession, and classification. Most techniques are demonstrated or conducted during field trips and laboratories.

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 odd-numbered years. (Same course as Anthropology 211.)

212A. Environmental Policy Analysis (4) III. Sabatier (Environmental Studies)

Lecture—3 hours; discussion—1 hour; seminar paper. Prerequisite: course in public policy (e.g. Political Science 107 or 108), course in bureaucratic policy making (e.g., Environmental Studies 166 or Political Science 181), course in intermediate statistics (e.g., Sociology 106 or Agricultural Economics 106.) An examination of selected topics in the formulation and implementation of environmental policy, with a principal emphasis on conceptual and methodological issues. Offered in odd-numbered years. (Same course as Environmental Studies 212A.)

212B. Environmental Policy Analysis: Evaluation (4) I. Schwartz, 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. Population, Environment, and Social Structure (4) II. Cramer (Sociology)

Seminar—3 hours; term paper. Prerequisite: at least one course in population or human ecology, or in environment and resources. Relationships among population dynamics, resource scarcity and environmental problems, and social structure; focus on demographic content of global ecological models and simulations, ecological content of modern demographic theories, and debates about scarcity, inequality, and social conflict and change. Offered in 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) I.** K.E.F. Watt (Zoology)

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing. Application of basic ecological principles to the interpretation of biotic and abiotic interrelationships of a

particular ecosystem. Recent advances in theory, technique, and basic information are emphasized.

232. Theoretical Ecology (3) III. Hastings

Lecture—3 hours. Prerequisite: courses 204, 205 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 development 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 to 3 hours. Prerequisite: consent of instructor. Topics in biological, human, physical, and chemical ecology. Students are expected to present an oral seminar on a particular aspect of the general topic under consideration. (S/U grading only.)

291. Biological Conservation (3) II.

Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Examines characteristics of populations that make them vulnerable to extinction and examines various methods that can be used in the restoration process. Although both plants and animals are of interest, emphasis will be on vertebrates. Offered in odd-numbered years.

296. Topics in Ecology (1) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour. Prerequisite: graduate standing in Ecology. (S/U grading only.)

297T. Tutoring in Ecology (1-4) I, II, III. The Staff (Chairperson in charge)

Lecture—1 hour; discussion—1 hour. Prerequisite: graduate standing in ecology; consent of instructor. Teaching ecology including conducting discussion groups for regular departmental courses under direct guidance of staff. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

299. Research (1-12) I, II, III. (Chairperson in charge)

Prerequisite: graduate standing. (S/U grading only.)

Economics

(College of Letters and Science)

Steven M. Sheffrin, Ph.D., Chairperson of the Department

Department Office, 381 Kerr Hall (752-0741)

Faculty

⁴Moshe Adler, Ph.D., Assistant Professor
Giacomo Bonanno, Ph.D., Visiting Assistant Professor

^{3,4}Andrzej Brzeski, Ph.D., Professor

^{2,3}Mark Dynarski, Ph.D., Assistant Professor

^{3,4}Robert C. Feenstra, Ph.D., Associate Professor

Bruce Glassburner, Ph.D., Professor Emeritus

Fusun Gönül, Ph.D., Visiting Assistant Professor

W. Eric Gustafson, Ph.D., Senior Lecturer

²L. Jay Helms, Ph.D., Associate Professor

Kevin D. Hoover, D.Phil., Assistant Professor

Hiroimitsu Kaneda, Ph.D., Professor

Tracy R. Lewis, Ph.D., Professor

Peter H. Lindert, Ph.D., Professor

²Louis Makowski, Ph.D., Associate Professor

Thomas Mayer, Ph.D., Professor

Julie A. Nelson, Ph.D., Assistant Professor

Alan L. Olmstead, Ph.D., Professor

John E. Roemer, Ph.D., Professor

Steven M. Sheffrin, Ph.D., Professor

¹T. Y. Shen, Ph.D., Professor

Joaquim Silvestre, Ph.D., Professor

Arthur M. Sullivan, Ph.D., Associate Professor

(Economics, Management)

Robert K. Triest, Ph.D., Assistant Professor

Elias H. Tuma, Ph.D., Professor

Gary M. Walton, Ph.D., Professor (Economics, Management)

Leon L. Wegge, Ph.D., Professor

²Wing T. Woo, Ph.D., Assistant 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	22-26
Economics 1A-1B	10
Statistics 13, 32, or 102	3-4
Mathematics 16A-16B-16C or 21A-21B-21C	9-12
Depth Subject Matter	40
Economics 100 or 100M; 101	10
One course from Economics 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-151A; 151A-151B; 160A-160B	8
Additional economics courses to achieve a minimum of 40 upper division units	18
Total Units for the Major	62-66

Recommended

Students considering graduate study in economics or business administration are strongly urged to take Mathematics 21A-21B-21C and 22A.

The Economics Department suggests that Economics 100 and 101 be taken as soon as possible after the introductory courses.

Except under extraordinary circumstances, not more than three economics courses may be taken in any one quarter. In special cases, the department will accept a limited number of related upper division courses from other departments in satisfaction of the economics upper division course requirements. Approval from a departmental adviser is required in all such cases.

Graduation with Highest Honors. To graduate with Highest Honors in Economics, a student must take all upper division courses in Economics for a letter grade and must earn a grade-point average in those courses equal to that required by the College in all University of California work.

Major Advisers. M. Adler, A. Brzeski, R.C. Feenstra, F. Gönül, W. E. Gustafson, K.D. Hoover, H. Kaneda, T.R. Lewis, L. Makowski, J. Silvestre, R.K. Triest, E.H. Tuma, W.T. Woo.

American History and Institutions. This University requirement can be satisfied by completion of Economics 111A, 111B. (See also under University requirements.)

Teaching Credential Subject Representative. A. Brzeski. See also 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, P. Lindert, T. Mayer, A.L. Olmstead, J.E. Roemer, T.Y. Shen, L.L. Wegge.

Courses in Economics

Lower Division Courses

1A. Principles of Microeconomics (5) I, II, the Staff; III, Gustafson

Lecture—3 hours; discussion—2 hours. Courses 1A and 1B may be taken in either order. Analysis of the allocation of resources and the distribution of income through a price system; competition and monopoly; the role of public policy; comparative economic systems. General Education credit for non-GE course sequence (1A-1B) which will satisfy one GE course: Contemporary Societies/Introductory. (CAN Econ 4)

1B. Principles of Macroeconomics (5) I, Kaneda; II, Tuma, Sheffrin; III, the Staff

Lecture—3 hours; discussion—2 hours. Courses 1A and 1B may be taken in either order. Analysis of the economy as a whole; determinants of the level of income, employment, and prices; money and banking, economic fluctuations, international trade, economic development; the role of public policy. General Education credit for non-GE course sequence (1A-1B) which will satisfy one GE course: Contemporary Societies/Introductory. (CAN Econ 2)

11A. Elementary Accounting (4) I, II. The Staff

Lecture—3 hours; laboratory—2 hours. 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.

11B. Elementary Accounting (4) II, III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 11A. Continuation of course 11A.

92. Internship and Field Work (1-12) I, II, III. The Staff

Laboratory—3-36 hours; term paper. Prerequisite: junior or senior standing; availability of internship position or approved field work project; stock-brokerage interns must have completed course 11A-11B; consent of instructor. Intensive study of practical application of concepts in economics, stressing research methods and empirical analysis. (P/NP grading only.)

98. Group Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Primarily for lower division students. (P/NP grading only.)

99. Individual Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

100. Intermediate Micro Theory (5) I, II, III. The Staff

Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B and Mathematics 16A or 21A with a grade of C- or better in each course. 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) I, Silvestre

Lecture—4 hours; discussion—1 hour. Prerequisite: courses 1A-1B and Mathematics 16A-16B or 21A-21B, each with a grade of C- or better. Price and distribution theory under conditions of perfect and imperfect competition. Welfare economics. Extensive use of algebra and 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 and Mathematics 16A or 21A with a grade of C- or better in each course. 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.

106. The Great Economists—Ideas, Theories and Ideologies (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B. Perspectives on capitalism and markets by major economic thinkers. Emphasis on links to other social sciences. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Economics 1A-1B.

***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. 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 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. Kaneda

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) I, 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) II. The Staff

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) III. The Staff

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. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B, 100 (or 100M). Marxian economic theories, including theories of value, surplus value and exploitation; accumulation, the business cycle and crises; the role of the State and its relation to classes; imperialism. Writings of Marx and economists in the Marxian tradition will be studied.

***120. Economics of War and Peace** (4) III. Tuma

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1A-1B. Explores economic causes and effects of war; analyzes war and peace situations by comparing theory with practice in specific wars as case studies. Offered in odd-numbered years.

121A. Industrial Organization (4) I, Adler

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. Lewis

Lecture—3 hours; to be arranged—1 hour. Prerequisite: course 121A. Public policy in a private enterprise economy; antitrust and other policies toward industry; economics of regulated industries.

123. Ecology and Economics (4) I, Gustafson

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Economics 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, Adler; II, Sullivan

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. Silvestre

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. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A, 1B, 11A, Mathematics 16A, and Statistics 13. General background and rationale of corporation; finance as resource allocation over time; decision making under uncertainty and the role of information; capital market and interest rate structure; financial decisions. Students who have completed Agricultural Economics 171A may not receive credit for this course.

135. Money, Banks and Financial Institutions (3) I, Mayer

Lecture—3 hours; discussion—1 hour. 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. Mayer

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 135 and 136A. Evaluation of monetary policy, its impact on the economy and past performance, the problem of inflation.

140. Econometrics (4) III. Nelson

Lecture—3 hours; laboratory—2 hours. Prerequisite: courses 100, 101, Mathematics 16A-16B or 21A, and Statistics 13. Introduction of problems of observation, estimation and hypotheses testing in economics through the study of the theory and application of linear regression models, critical evaluation of selected examples of empirical research and exercises in applied economics.

***150A. Economics of Trade Unionism** (4) II. The Staff

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. The Staff

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) I. The Staff

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) II. The Staff

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, Lindert; II, the Staff

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, III. Woo

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, the Staff; III, Glassburner

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) II. 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.** The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of Europe. Consult department for course scheduling.

***175. Economy of Sub-Sahara Africa (4) I, II, III.** The Staff (Chairperson in charge)

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1A-1B or consent of instructor. Intensive reading, discussion and research on selected topics from the economies of the countries of the Sub-Sahara. Consult department for course scheduling.

190. Topics in Economics (4) I, II, III. The Staff; II, Roemer; III, Lindert and staff

Lecture-discussion-seminar—4 hours. 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. Innes (Agricultural Economics)

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) III. Makowski

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. Hoover

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Macro static theory of income, employment, and prices.

200E. Macroeconomic Theory (4) III. Sheffrin

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 200B and 200D; Mathematics 16A-16B; or consent of instructor. Macrodynamics 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. Wegge

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; III, the Staff

Seminar—4 hours. Prerequisite: courses 200A through 200E or consent of instructor. Recent developments in economic theory.

203A. Advanced Economic Theory (4) I. Silvestre

Seminar—4 hours. Prerequisite: courses 200A and 200B; Mathematics 127A recommended. Advanced topics in the theory of the firm, distribution theory; welfare economics.

203B. Advanced Economic Theory (4) III. Makowski

Seminar—4 hours. Prerequisite: courses 200A and 200B; Mathematics 127A recommended. General equilibrium theory; capital theory; growth theory.

204. Microeconomic Analysis (5) I. The Staff

Lecture—4 hours; discussion—1 hour. Prerequisite: course 100 (or 100M) or Agricultural Economics 100A, 100B and Mathematics 16A, 16B. Open to advanced undergraduates with consent of instructor. Economic reasoning and social choice: behavior of firms and households, theory of markets, partial and general equilibrium analysis, welfare economics, illustrations and applications. (Same course as Agricultural Economics 204.)

205. Macroeconomic Analysis (5) I. Hoover

Lecture—3 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. Contemporary Economics Seminar (3-5) I. Hoover; II, Silvestre; III, Bonanno

Seminar—2 hours and discussion—2 hours (3 units); plus seminar presentation (5 units). Seminar series, consisting principally of outside speakers, on topics of current research. Discussion sections in which instructor and students review background material. Students who enroll for 5 units present seminar on their own work. (S/U grading only.) May be repeated for credit.

***210A. Economic History (4) I.** Tuma

Lecture-discussion—4 hours. Economic history of the eastern hemisphere in the modern period. Medieval Europe or other regions may be studied, depending on student interest.

210B. Economic History (4) I. Olmstead

Lecture-discussion—4 hours. The United States from colonial times to the present. Other areas of the western hemisphere may be studied, according to student interest.

210C. Economic History (4) II. Lindert

Seminar—4 hours. Prerequisite: a graduate course in economic history. Selected topics and issues, emphasis on current research. (Quarter offered to be flexible.)

215A. Economic Development (4) I. Jarvis (Agricultural Economics)

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.** ——— (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 200B, 215A, 215B. Analysis of development plans, programs and sectoral and regional programs and policies. Application of macroeconomic models, input-output, Social Account

Matrix (SAM) and programming techniques. Analysis and case studies of methods of project evaluation. (Same course as Agricultural Economics 215D.)

***216. Economic Systems (4) I.** Brzeski

Lecture—4 hours. Comparative study of economic systems, with reference to their organization and institutions, their values and goals, and their economic performance.

***217. Economics of Planning (4) II.** Brzeski

Lecture—4 hours. Theories and principles of economic planning under various economic systems.

***219. Marxian Economic Theory (4) II.** 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. Bonanno

Lecture—3 hours; to be arranged—1 hour. Analysis of market structure, business behavior, and economic performance under conditions of limited governmental interference.

221B. Industrial Organization (4) II. Adler

Lecture—2 hours; seminar—2 hours. Social standards and public policies toward the business sector of the economy.

221C. Topics in Industrial Organization (4) III. Lewis

Lecture—3 hours; seminar—1 hour. Prerequisite: course 221A. Advanced topics in industrial organization and in applied microeconomics. Emphasis on current research. Contents may vary from year to year.

222. Law and Economics (4) II, 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) III.** 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) I.** 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. Nelson

Lecture—2 hours; seminar—2 hours. Prerequisite: course 200A or 204. 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, transfer in income and in-kind, consumer protection, pollution, transportation and congestion).

230B. Public Finance (4) III. Bonanno

Lecture—2 hours; seminar—2 hours. Prerequisite: course 200A or 204. Taxation and stabilization: distribution 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 the debt.

235A. Alternative Approaches to Monetary Analysis (4) I. Mayer

Lecture—3 hours; discussion—1 hour. Prerequisite: course 200D (may be taken concurrently). Focuses on relation between changes in money supply and changes in nominal GNP. Also discusses the effect of changes in money supply on interest rates.

235B. Monetary Theory (4) II. Hoover

Lecture—3 hours; discussion—1 hour. Prerequisite: course 235A. Emphasizes problem of finding an appropriate place for money in microeconomic/general equilibrium models. Consideration given to meaning of money, its relation to inflation and the real economy and to its role in models of finance.

235C. Monetary Policy (4) III. Mayer

Lecture—3 hours; discussion—1 hour. Organization of the Federal Reserve Bank, the definition of money, goals and tools of monetary policy, alternative targets for monetary policy, impact of monetary policy, the problem of lags, alternative policies.

240A. Econometric Methods (4) III. Burt (Agricultural Economics)

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. Havenner (Agricultural Economics)

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 (Agricultural Economics)
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) I. Triest
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 150A-150B or the equivalent. Philosophy, theory and history of American and foreign labor movements; union structure, organization and collective bargaining under changing labor market conditions; current labor market issues.

250B. Labor Economics (4) III. Triest
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. Feenstra
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200A or 204. Theory of trade determinants; gains from trade; tariffs and effective protection; economic unions.

260B. International Economics (4) II. Woo
Lecture—3 hours; discussion—1 hour. Prerequisite: course 200D or 205. 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 260A and 260B. Survey of current literature in international trade theory.

***280. Orientation to Economic Research (2) II.** 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. Gustafson
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
Hugh C. Black, Ph.D., Professor Emeritus
Vincent A. Crockenberg, Ph.D., Lecturer
Linnea C. Ehri, Ph.D., Professor
Richard A. Figueroa, Ph.D., Professor
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., Associate 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., Professor Emeritus
David R. Wampler, Ph.D., Lecturer in and Supervisor of Teacher Education
George D. Yonge, Ph.D., Professor

Program of Study

The Department of Education does not offer an undergraduate major program. However, it does offer a minor.

Minor Program Requirements:

Educational theory is considered to be the foundation or basic area for undergraduates to elect as a minor if they wish to (1) major in an allied program, (2) obtain a teaching credential, (3) obtain a master's degree in education or allied field, (4) obtain a Ph.D. degree in education, (5) enter a profession that focuses on work with people, (6) seek employment in governmental or industrial training programs, or (7) obtain a better understanding of the issues and concerns of public and private education.

	UNITS
Education (minimum units)	20-23
Education 110 or 111	4
One course from Education 120, 122, 123	4
Depth courses	12-15
At least 12-15 units from Education not used above: 100, 110, 111, 115, 117, 118, 120, 122, 123, 130, 132, 142, 145, 151, 152, 163, 180, or 175, chosen in consultation with an Education adviser.	

Minor Advisers. All faculty members who teach undergraduate courses.

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. M. Gatheral, S. A. Ostergard, S. J. Skinner, D. R. Wampler.

Bilingual Emphasis. B. J. Merino.

Credential Counselors: Single Subject. J. E. Lowry, V. A. Perkes.

Graduate Adviser. J. H. Sandoval (Credential Program).

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. J.H. Sandoval (M.A. degree).

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 Schools (4) I, II, III. Lowry, Minnis, Skinner, Wampler
Lecture—3 hours; field work—3 hours. Prerequisite: upper division standing. Study of occupational concerns of teachers;

skills for observing classroom activities; school organization and finance; school reform movement; observing, aiding and tutoring in schools.

110. Educational Psychology: General (4) I, II, III. Ehri, Sassenrath
Lecture-discussion—4 hours. Prerequisite: Psychology 1; upper division standing. Learning processes, cognitive development, individual differences, testing and evaluation. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: introductory course in Psychology.

111. Introduction to Psychopedagogy (4) I, II, III. Yonge
Lecture-discussion—4 hours. Prerequisite: Psychology 1 and upper division standing. Introduction to the human science of pedagogics (education) with special emphasis on the psychopedagogic perspective. Such topics as the pedagogic situation, learning and becoming, teaching and the lesson structure, and the methods of pedagogics will be considered.

114. Quantitative Methods in Educational Research (4) I. Yonge
Lecture-discussion—4 hours. Prerequisite: two years of high school algebra. Problems and methods in data analysis. Design of research projects. Some consideration of procedures suited to digital computers.

115. Educating Handicapped Children (2) II, III. Figueroa, Spring
Lecture—2 hours. Prerequisite: upper division standing. Educational issues and processes involved in teaching handicapped children.

117. Psychology of Reading (4) I. Ehri
Lecture-discussion—4 hours. Prerequisite: Psychology 1 and upper division standing. Theory and research on psycholinguistic processes involved in learning to read. Topics include reading readiness, word recognition and spelling, knowledge of the orthographic system, phonological awareness, interactive processes, influence of dialect, difficulties of poorer readers.

118. Comprehension in Reading and Listening (4) II. Spring
Lecture-discussion—4 hours. Prerequisite: upper division standing. Theory and research of comprehension and learning of verbal material. Written and spoken material of two types, narrative and expository, considered. Topics include vocabulary acquisition as well as instruction of verbal skills at the sentence and passage levels.

120. Philosophical and Social Foundations of Education (4) I, II, III. Arnstine and staff
Lecture-discussion—4 hours. Prerequisite: upper division standing. Philosophical, historical, and sociological study of education and the school in our society. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 17B or Philosophy 14.

122. Civil Rights of Teachers and Students (4) I, II, 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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 1.

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.

132. Church, State and School (4) III. Crockenberg
Discussion—4 hours. Prerequisite: upper division standing; course 122 or the equivalent. Analysis of the decisions of the United States Supreme Court applying the free exercise and establishment clauses of the first amendment to the relationship between church, state, and schools. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 1.

142. Race, Ethnicity and California Schools (4) I. Crockenberg
Discussion—4 hours. Prerequisite: upper division standing. Analysis of the changing racial and ethnic composition of the California school population, requirements of the United States and California constitutions with regard to school desegregation, and current efforts to develop effective multicultural curricula.

145. Aesthetics in Education (4) II. Arnstine
Lecture-discussion—4 hours. Prerequisite: upper division standing. Considers the role of the arts in education. Examines

various conceptions of the nature of art and aesthetic experience, and relates this to instructional procedures.

***150. Tutoring Children and Youth (2) I, II, III.** The Staff (Chairperson in charge)

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. 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. 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.

160. Peer Counseling (2) I, II, III. Noel

Seminar—2 hours. Prerequisite: upper division standing; consent of instructor. Study of peer counseling techniques and development of peer counseling skills. (P/NP grading only.)

163. Guidance and Counseling (4) I, II, III. Figueroa, Sandoval

Lecture—4 hours. Prerequisite: course 110 (may be taken concurrently). Nature and scope of pupil personnel services; basic tools and techniques of guidance; theory and practice of counseling psychology, with emphasis on educational and vocational adjustment.

175. Critical Thinking in Classrooms (4) III. Minnis, Friedman

Lecture—2½ hours; discussion—1½ hours. Prerequisite: upper division standing. Critical thinking skills and rigorous analysis of argumentation in classrooms on the basis of philosophical and educational theory. Enables teachers to utilize existing school curricula to engage children in discussions of significant scientific, social, ethical, and philosophical issues.

180. Computers in Education (3) I, II, III.

Lecture—1 hour; seminar—1 hour; laboratory—3 hours. Prerequisite: upper division standing. Applications of computers in education as instructional, intellectual, and communication tools.

192. Internship (1-5) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour; field work—3 to 15 hours; term paper. Prerequisite: upper division standing; consent of instructor. Work-learn experience in schools under supervision of a faculty member. 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: upper division standing and consent of instructor. (P/NP grading only.)

Graduate Courses

200. Educational Research (3) III. Spring, Ehri

Seminar—3 hours. Prerequisite: course 114 or the equivalent. Study of educational research and evaluation designs, review of computer solutions to related statistical procedures. Case problems provide practice in designing and reporting research.

205. The Concept of Mind in Teaching (4) III. Arnstine

Seminar—4 hours. Philosophical analysis of the problems of educational practice which are created, aggravated, and sometimes solved by varying conceptualizations of mind and thinking.

207. Concepts of the Curriculum (3) I, 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) II. Crockenberg

Seminar—4 hours. Prerequisite: graduate standing. 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

Seminar—4 hours. Critical analysis of the literature available in English dealing with theoretical and practical issues in

education in terms of Pedagogics (i.e., an existential phenomenological approach to the systematic study of education).

211. Psychopedagogics (4) II. Yonge

Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. Phenomenological approach to the psychological aspects of the educational situation (psychopedagogics). A critical consideration of how psychopedagogics contributes to the theory and practice of education.

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) III. Sandoval

Lecture—4 hours. Prerequisite: courses 114 and 219, admission to school psychology credential program. Theories of intellectual functioning and the measurement of cognitive abilities in school-aged children. Supervised practice in administration and scoring of contemporary tests for children including the WISC-R, the WAIS-R, the Stanford Binet, the McCarthy Scales of Children's Ability.

***214. Assessment of Children's Personality (4) II. Sandoval**

Lecture—3 hours; field work—3 hours (minimum). Prerequisite: admission to school psychology credential program; courses 213 and 218; and familiarity with basic personality theory and theories of motivation. Study of the projective hypothesis; concepts of personality and its measurement; legal and ethical issues in personality assessment; interviewing techniques in assessment of social and affective functioning; specific measures in personality assessment; reporting on personality assessments; school interventions. Offered in even-numbered years.

215. Motivation and Behavior Modification (4) I, Spring

Seminar—4 hours. Prerequisite: graduate standing or consent of instructor. Factors related to influencing behavior in educational settings, including analyses of intrinsic and extrinsic motivation, psychological reactance, locus of control, achievement attribution, and behavior modification.

218. Testing Minority Children (4) 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) II. 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) II. Merino

Seminar—3 hours. Prerequisite: course 151; knowledge of a foreign language. Discussion and analysis of recent research in bilingual and second language education. Topics include: language acquisition in second language learners and bilinguals, second language teaching methods, language use models in bilingual education, interaction analysis in bilingual-cross-cultural classroom, use of the vernacular in classroom.

***252. Multicultural Teaching and Curriculum (3) I. Merino**

Seminar—2 hours; field work—3 hours. Prerequisite: graduate standing or consent of instructor. Cross-cultural research on socialization, motivation, language acquisition and cognition and its application to effective classroom strategies and curriculum development for minority students. Students will develop and implement multicultural curriculum as well as use ethnographic research techniques in an educational setting.

253. Language and Literacy in Linguistic Minorities (3) II. Merino

Seminar—2 hours; fieldwork—3 hours. Prerequisite: familiarity with another language and culture; graduate standing. Analysis and application of research on oral language development and literacy in language minority students, through the development, implementation and evaluation of research based language arts curriculum.

270A. Reading Diagnosis and Prescription (3) III. Gatheral

Lecture-discussion—3 hours. 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. Gatheral**

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

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-discussion—3 hours. 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.

290C. Research Conference in Education (1) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: graduate standing. Presentations and critical discussions of research in education by graduate students with their major professor. May be repeated twice for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

299. Research (1-6) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Professional Courses

300. Reading in the Elementary School (4) I, Gatheral, Skinner

Lecture—3 hours; field work—3 hours. Prerequisite: graduate standing. Principles, procedures, and curriculum materials for teaching of reading. Includes decoding skills with a special emphasis on phonics, comprehension skills, study skills, and reading in the content areas.

301. Reading in the Secondary School (4) II, III. Gatheral and staff

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) II. 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. The Staff (Chairperson in charge)

Lecture-discussion—2 hours; laboratory—2 hours. Prerequisite: admission to multiple subject credential program. Understanding the principles of education in the arts through participation. Development of concepts, introduction to media, and techniques suitable for the elementary school with emphasis on cross-discipline exploration.

304A. Teaching in the Elementary Schools (5-8) I. The Staff (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. Prerequisite: acceptance into a teacher education program. Supervised teaching in regular or special education classrooms in middle grades. Current conceptions of the middle-grades curriculum with emphasis on social, biological, and physical sciences. Effective teaching methods.

305B. Teaching in the Middle Grades (5-8) II. The Staff (Wampler in charge)

Lecture—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.

307. Methods in Elementary Science (2) III. Wampler, Ostergard

Lecture-discussion—2 hours. Prerequisite: acceptance into teacher education program. Principles, procedures and materials for teaching the biological and physical sciences in elementary schools.

308. Methods in Elementary Social Studies (2) II. Wampler

Lecture-discussion—2 hours. Prerequisite: acceptance into a teacher education program. Principles, procedures and materials for teaching history and the social sciences in elementary schools.

309. Early Childhood and Kindergarten Education (3) III. Skinner

Lecture—3 hours. Prerequisite: upper division or professional standing. Methods, materials, and history of educational programs for the preschool through primary grades. Development of curriculum methods and materials which stress integration of appropriate subject areas with emotional, social, creative, physical, and cognitive development.

***313. Secondary Art Methods (3) I.** The Staff (Chairperson in charge)

Lecture-discussion—2 hours; laboratory—3 hours. Prerequisite: 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, II. 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. The Staff (Chairperson in charge)

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) III. 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. (S/U grading only.)

342. Teaching Practicum for International Students (2) II. Minnis

Lecture-discussion—2 hours. Prerequisite: graduate standing in any department or program. Intended for international students. Teaching techniques for college instruction with special recognition of language and cultural differences experienced by international instructors. Information on and practical experience with the organization and oral presentation of college-level subject matter. (S/U grading only.)

351. Advanced Fieldwork in Bilingual Education: Teaching (3-5) I. The Staff (Merino in charge)

Seminar—2 hours; field work—3-9 hours. Prerequisite: acceptance into a bilingual education specialist program. Discussion, analysis and implementation of methods, techniques and material in the bilingual/cross-cultural classroom, including team teaching with paraprofessionals, implementation of language-use models in the classroom, lesson planning, selection and use of bilingual/cross-cultural materials.

352. Advanced Fieldwork in Bilingual Education: Evaluation and Supervision (3-5) II. Merino

Seminar—2 hours; field work—3-9 hours. Prerequisite: upper division standing; acceptance into a bilingual/cross-cultural specialist credential program. Provides opportunity to acquire evaluation and supervisory skills in the field under the supervision of University staff and an experienced program evaluator/supervisor in bilingual/cross-cultural education.

361A-361B-361C. School Psychology: Introduction (3-3-3) I-II-III. Sandoval and staff

Seminar—2 hours; fieldwork—3 hours (minimum). Prerequisite: admission to school psychology credential program. History and theory of school psychology. Application of psychological theory to educational problems. Reading and mathematics curriculum for school psychologists. Crisis intervention and counseling in the schools. Fieldwork in schools and other institutions serving children. (S/U grading only.)

362A-362B-362C. School Psychology: Advanced (3-3-3) I-II-III. Sandoval, Figueroa

Seminar—2 hours; field work—4 hours. Prerequisite: courses 361A-361B-361C, 213, 218, 219. Theory and techniques of school-based mental health consultation and non-biased assessment. Legal principles related to special education practice and school psychology. Advanced case study techniques. (S/U grading only.)

363A-363B-363C. School Psychology: Internship (6-12) I, II, III. Sandoval, Figueroa

Seminar—2 hours; internship—18-32 hours. Prerequisite: admission to school psychology credential program; courses 361A-361B-361C, 362A-362B-362C, 213, 218, 219. Individual assessment and program evaluation, mental health consultation, intervention strategies to promote the school learning and adjustment of children. Selected topics in school psychology. (S/U grading only.)

***370. Advanced Fieldwork in Reading (2-6) I, II, III.** 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. Logo Programming in Education (2) II. Spring

Lecture—1 hour; laboratory—2 hours. Prerequisite: consent of instructor. Computer programming in Logo, a high-level computer language which is appropriate for instruction in elementary and secondary grades.

398. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

399. Individual Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

who meet the minimal admission requirements the opportunity to experience a different culture while making progress toward degree objectives. Students interested in the language, literature, art, culture, history, or governmental or social institutions of the countries or areas where study centers are located will gain substantially from first-hand academic and practical experience. The same is true for students of foreign affairs. All students, whatever their field of study, will broaden their outlook and gain new skills as the result of study in a foreign country. The academic—and non-academic—debts and credits of participation in the EAP should be weighed carefully prior to departure, however.

Application

Normally, students participate in the program during their junior year, but a limited number of students may be selected for participation as seniors. A few programs are open to graduate students as well. Students considering study abroad with the EAP should contact the EAP Office or the Coordinator's Office early in the fall quarter concerning application and filing deadlines. This is important, as deadlines for some centers, including the United Kingdom and Ireland, are in early November.

Application forms are available from the EAP Office. A provisional academic planning form, prepared in consultation with the coordinator or academic counselor and the major adviser, must be submitted along with the completed application to the EAP Office prior to the appropriate deadline. Applications received after the official deadline cannot be considered.

Students who do not meet the minimal requirements for acceptance (see under Education Abroad in the Introduction section) must consult the Campus Coordinator. Students who will have accumulated more than 145 units prior to the beginning of their planned year of study abroad must 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.

Education Abroad Program

Carolyn F. Wall, Ph.D., Campus Coordinator
Campus Coordinator's Office, 150 Mrak Hall
(752-0392)

Program Office, 323 South Hall (652-3014)

Programs of Study

The Education Abroad Program (EAP) of the University of California offers upper division students

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, Canada, Australia, Egypt, Ghana, Kenya, and New Zealand); (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. 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 exchange with French language universities in Quebec. 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 Göttingen, 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.

Denmark. A compulsory summer intensive language program precedes the academic year and continues through the fall semester. Instruction is in Danish, though examinations in English may be available. Most students concentrate on their major or a closely related field; independent study under tutorial supervision is expected.

University of Copenhagen. Broad availability of humanities and social sciences. Programs in communications, economics and international politics, history, linguistics, and medieval studies are of particular interest.

France. A compulsory intensive language course precedes the beginning of the academic year. All courses in the universities are taught in French. UC faculty directors are in residence at Bordeaux, Grenoble, Montpellier, 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 Lyon. Social sciences, art history; modern languages and linguistics; Arabic studies.

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.

Paris Center for Critical Studies. Film theory, literary criticism, philosophy, theater (literature, criticism, and history), historiography, and limited art history.

Pau-Paris. Participants spend the first semester at the University of Pau. At the end of January, they move to Paris to take courses at the Paris Center for Critical Studies. In addition to required core courses in French civilization, students take courses in humanities and social sciences, with emphasis on comparative cultural studies, French language, and critical studies.

University of Pau. Pau-Paris core courses, humanities, social sciences. Program in Basque studies is of special interest. Scholarships available for students of Basque or Bearnaise cultural background.

University of Poitiers. Humanities is taught, 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, Göttingen. Broad curriculum covering most majors. Excellent science programs, with substantial strength in biology, chemistry, and physics. Space in laboratory courses in biology and psychology may be limited.

Hungary. *Karl Marx University, Budapest.* A fall semester or full-year program jointly sponsored by UC and the University of Wisconsin at Madison. Offerings developed for the program include conversational Hungarian and courses in Central European history, culture, economics, and economic history.

Italy. A compulsory intensive program in language and history precedes the beginning of the academic year. Students who have completed only one year of Italian may become eligible for participation by attending a summer intensive-language program in Italy in order to attain the required third-year level, followed by the normal compulsory intensive-language program in Padua. A UC faculty director resident in Padua administers all EAP programs in Italy. All courses are taught in Italian.

University of Padua. History of art (including archaeology), Italian literature (including linguistics), and political science (which includes history, social sciences, geography, and demography, as well as political science in the American sense). Sciences are not available for UC students.

University of Venice. Economics, history; history of art.

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.

Bisonte International School of Graphic Arts. Etching and lithography for advanced undergraduates. Colored slides of portfolio of etchings must be submitted for admission.

Cini Foundation, Venice. Independent study projects for graduate students in art history.

Norway. Knowledge of Norwegian is not required, but a compulsory intensive course in Norwegian (mid-June to mid-August) precedes the beginning of the academic year. Intensive language study is continued during the fall semester. All courses are taught in Norwegian.

University of Bergen. Humanities, social sciences, natural sciences, and mathematics are available, but space in the sciences may be limited. The usual pattern is study of a single subject, usually the major or a closely allied field, for the entire year.

Portugal. A six-week summer intensive-language program at UC Santa Barbara is required before departure for the academic year program. Students enroll in courses taught through the Department for Foreign Students as well as regular offerings at the University of Lisbon.

University of Lisbon. Portuguese language, literature, and culture; classical and romance languages, literature, and linguistics; history, philosophy, geography, art history, and cultural anthropology.

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 13 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 College (London), University of East Anglia, University of Exeter, University of Hull, University of Kent at Canterbury, University of Lancaster, University of Leeds, University of Sussex, 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 College of Wales at Aberystwyth.*

Generally, the host universities offer a broad curriculum that includes most liberal arts majors. Life sciences and physical sciences are available.

USSR. Two semester programs are available, depending on language preparation. Students with two years of university-level Russian participate in a program developed for UC. Those with three years of university-level Russian may apply for a program organized by the Council on International Educational Exchange (CIEE), a consortium of American universities in which UC participates. Both programs are primarily intended for language majors, but are 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 taught 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, science and business. Students with command of Hebrew have access to a broad curriculum throughout the Hebrew University.

Asia

Hong Kong. A limited selection of courses is offered in English. Knowledge of Chinese is not required for acceptance; however, all students are required to complete at least two courses in Chinese culture, history, or language prior to departure. A compulsory

intensive Cantonese program precedes the beginning of the academic year. All students are required to include 18 units of Mandarin or Cantonese in their annual program.

Chinese University of Hong Kong. Humanities and social sciences, with emphasis on Chinese studies. Art studio and music performance courses are available. (Information about courses to be offered in English is announced only one week before instruction begins.)

India. Instruction is in English. A compulsory intensive language program in conversational Hindi precedes the academic year. Students will take a year-long core program focusing on development in modern India and Indian culture and tradition, as well as continue their study of Hindi. During the second and third quarters, students will also take regular coursework at the University of Delhi.

University of Delhi. Humanities and social sciences are well represented, with some offerings in fine arts and mathematics.

Indonesia. An eight-week summer intensive-language program at *Gadjah Mada University* in Yogyakarta is required for all students. Those with less than two years of University-level Indonesian must then take a ten-week inter-term program of continued study of the language, with additional courses in Indonesian history and culture, taught in English. Students enroll in regular courses at one of five institutions for the second semester. Instruction is in Indonesian; tutorial assistance may be available.

It is possible to apply for the summer intensive language program only. Students may take more advanced language in subsequent years.

Gadjah Mada University. Agriculture, anthropology, biology, economics, geography, mathematics, philosophy, psychology, political science.

Institute Seni Indonesia (ISI). The Indonesian Institute of the Arts: visual arts, music, dance, theater, fine arts, ethno-musicology.

Akademi Seni Tari Indonesia (ASTI) at Denpasar and Bandung. The Indonesian Dance Institute of Bali: dance, music, and theater.

University of Padjadjaran at Bandung. Development studies, environmental/ecology studies, humanities and social sciences are available.

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.

International Christian University, Mitaka (Tokyo). Humanities and social sciences; emphasis on Japanese language and intercultural communication. A limited number of courses taught in English are available.

Sophia University, Tokyo. Comparative culture studies, Japanese language and literature, history, political science, economics and business are available. Many are taught in English.

Tokyo Institute of Technology. Graduate students proficient in Japanese may do research and take courses in science and engineering.

People's Republic of China. EAP offers a full-year program in Beijing; a semester program in Nanjing is available through the Council on International Educational Exchange. Intensive language study in 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 prerequisite is one year of college-level Chinese.

Peking University. A year-long program focused on advanced-level instruction in Chinese language and literature. Courses are conducted by the Chinese Language Teaching to Foreigners Division of Peking

University. The prerequisite for the programs is two years of college-level Chinese.

Taiwan, Republic of China. Students participating in the Chinese Language and Culture Studies program in Taipei receive instruction in the Chinese language and enroll in lecture courses (taught in English) on Chinese culture and society arranged by CSU International Programs. Courses in art history, literature, economics, history and political science are available. Prior coursework in Chinese culture, history and language are recommended.

(This is a cooperative program with California State University International Programs.)

Thailand. An eight-week summer intensive language program at *Chiangmai University* is required for all students. This is followed by a seven week inter-term program of continued study of the Thai language, with additional courses in Thai history and culture, taught in English. Most students will remain at *Chiangmai University* for the second semester and continue taking courses in Thai language and area studies classes taught in English. Students with sufficient language background (more than two years of University-level Thai language) have the option of enrolling at *Chulalongkorn University* in Bangkok for the second semester. Instruction is in Thai, though English-speaking tutors are available.

It is possible to apply for the summer intensive-language program only. Students may take more advanced language courses in subsequent years.

Africa

Ghana. *University of Ghana, Legon-Accra.* Open to undergraduate and graduate students. Instruction is in English. As in the British system, students take a year-long program of study in a single area. End-of-year examinations are given only once and are mandatory for credit to be awarded.

Offerings include humanities and social sciences, with emphasis on African studies. There is a strong program in ethnomusicology.

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.

Togo. *Study and field experience (SFE).* An eight-week summer program developed by UC. Four weeks of academic coursework in French language and contemporary Africa are taught at the *University of Benin, Lomé*, followed by four weeks of field work.

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.)

Costa Rica. University of Costa Rica, San Jose. As is appropriate in this Hemisphere, the academic year extends from early March through December. UC participants leave in January. Applications for participation in this program are due in May for a January departure.

A mandatory intensive language program precedes the academic year. During the academic year, courses in Central American studies (history, literature, political science, etc.) form half of the curriculum, with the remaining courses taken from any of the faculties at the University of Costa Rica.

Costa Rica Tropical Biology Quarter at Monteverde. This spring quarter program provides an unusual opportunity for undergraduates to study and do field research in a tropical cloud forest. Applicants should have completed a year of biology, including one upper-division organismal biology course, and have some background in Spanish language.

Costa Rica Medical Quarter at San Jose. This winter quarter program provides medical students the opportunity to combine intensive medical Spanish instruction and clinical studies. Conversational ability in Spanish is required.

Mexico. *Universidad Nacional Autonoma de Mexico (UNAM), Mexico City.* A compulsory intensive language program precedes the beginning of the school year, augmented by courses in contemporary Mexico (history, art, literature, etc.). A month-long field placement doing volunteer work in a community outside of Mexico City is an integral part of this program. Students have the option of spending one semester (two UC quarters) at UNAM, or a full year.

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.

Summer Intensive Language Quarter in Morelia. This program provides total immersion in Mexican society and Spanish language instruction for students who have completed one year of University-level Spanish before departure. It is not appropriate for advanced students in Spanish.

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 ethno-history 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.)

Canada

Students may enroll for one semester or a full year. Studies on the major or a closely allied field is expected.

University of British Columbia (UBC). Most academic disciplines are available. Areas of special interest include Pacific Rim and Canadian Studies.

Australia and New Zealand

As is appropriate in the Southern Hemisphere, the academic year extends from the beginning of instruction in early March through the examination period, which starts in November. UC participants must leave in February, and will be unable to attend classes during the winter term preceding departure. Applications for participation in these programs are due in May for a February departure. The universities follow the British system of higher education.

The Australian program includes the *Australian National University* in Canberra; three institutions in the Melbourne area, *University of Melbourne*, *Monash University* and *La Trobe University*; the *University of Sydney*, *Macquarie University*, and the *University of New South Wales* in Sydney; *University of Adelaide* and *Flinders University* in South Australia. A full range of academic programs is available. The Study Center accommodates a limited number of students. A UC faculty member in Melbourne directs all programs.

The New Zealand program includes the *University of Auckland*, *Lincoln College* in Christchurch, the *University of Otago* in Dunedin, and *Massey University* in Palmerston North. All academic disciplines are available; programs in textiles and a variety of agricultural sciences are of special interest.

Endocrinology (A Graduate Group)

Judith L. Turgeon, Ph.D., Chairperson of the Group

Group Office, 4136 Medical Sciences-1A (Human Physiology, 752-3230)

Graduate Study. The interdepartmental Graduate Group in Endocrinology offers programs of study leading to the M.S. and Ph.D. degrees. The M.S. degree is offered under Plan I (thesis) of the master's program. Detailed information regarding graduate study is available through the Group Chairperson. See also the Graduate division section in this catalog.

Graduate Advisers. Contact the Program Office.

Courses in Endocrinology

Graduate Courses

218. Mammalian Endocrinology and Homeostasis (6) III. Turgeon, Walsh

Lecture—5 hours; seminar—1.5 hours. Prerequisite: Physiological Sciences 101A-101B or Biochemistry and Biophysics 101A-101B and Physiological Sciences 110; consent of instructor. Physiological and biochemical properties of mammalian endocrine system both at the cellular and the systemic level. Biochemical principles that regulate homeostasis especially in organ-organ interrelationships of metabolites and minerals. Reproductive endocrinology. Seminar presentation of key current literature.

220. Endocrinology Literature Critique (1) I, II. Turgeon
Discussion—1 hour. Prerequisite: consent of instructor. Critical reading and evaluation of current original publications in endocrinology. Selected papers will be presented and discussed in detail by faculty and students. May be repeated for credit. (S/U grading only.)

240. Biochemical Endocrinology (3) III. Adams (Animal Science)

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Examination of recent advances in biochemical endocrinology and molecular and cell biology of endocrine systems with emphasis on processes of hormone and receptor synthesis, second messenger phenomena, and hormonal control of gene expression.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
Seminar—1 hour. Prerequisite: consent of instructor. Discussion and critical evaluation of advanced topics and current trends in research in endocrinology. May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor.

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
(S/U grading only.)

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
John Killeen, Ph.D., Associate Dean—Graduate
Studies and Research (Livermore)
Zuhair A. Munir, Ph.D., Associate Dean—
Graduate Studies

College Office, 2132 Bainer Hall

The Major Programs

Sixteen 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 and the Aeronautical Science and Engineering curricula are six 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 the Graduate Division section of this catalog. 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 four Lower Division Programs shown below. The first program (I) is common to most major programs; it is for students who are majoring in the six programs not listed under programs (II) through (IV), i.e., Aeronautical Science and Engineering, Civil Engineering, Materials Science and Engineering, Mechanical Engineering, and the double majors with the exception of Chemical Engineering/Materials Science and Engineering and Electrical Engineering/Materials Science and Engineering. The second (II) is for those majoring in Agricultural Engineering and the three Agricultural Engineering options, Aquacultural and Fisheries Engineering, Food Engineering, and Forest Engineering; the third (III) is for those majoring in Chemical Engineering and the double major, Chemical Engineering/Materials Science and Engineering; and the fourth (IV) is for students majoring in Computer Science and Engineering, Electrical Engineering and the double major Electrical Engineering/Materials Science and Engineering.

The lower division program for students who enter the College with 84 or more quarter units of credit is explained in the College section, under Admission to Advanced Standing.

Engineering—Lower Division Program I

Requirements common to all Engineering majors except Agricultural Engineering, the three Agricultural Engineering options, Chemical Engineering, and the double major, Chemical Engineering/Materials Science and Engineering, Computer Science and Engineering, and Electrical 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	3	1 or 2
(Engineering 3 is designed for freshman students. More advanced students may petition to substitute 3 units of technical electives for Engineering 3.)		
Engineering graphics in design—Engineering 4	3	1 or 2
Applications of computers— Engineering 5	3	2 or 3
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 and Communication 1 or 3	4	6
Humanities-social sciences electives* (see College requirements)	9	
Unrestricted electives*	7	
(*Students majoring in Civil Engineering or Civil Engineering/Material Sciences and Engineering are required to complete 12 units of physics including Physics 8A, 8B and 8C. In addition, either Physics 8D, Chemistry 1C, Biological Science 1 or Geology 50-50L is required. Further, 13 units of Humanities-Social Sciences electives and 3 units of Unrestricted electives are required in these two majors.)		
Total Lower Division Units	90	

Agricultural Engineering—Lower Division Program II

Requirements for major in Agricultural Engineering, and the three Agricultural Engineering options (Aquacultural and Fisheries Engineering, Food Engineering, and Forest 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
Basic statistical analysis, Statistics 32	3	5
General physics, Physics 8A-8B-8C-8D	16	3-4-5-6
General chemistry, Chemistry 1A-1B	10	2-3
Organic chemistry, Chemistry 8A ..	3	6
Principles of biology, Biological Sciences 1	5	4
General bacteriology (required for Food Engineering option), Microbiology 2; or introductory survey of botany (required for Forest Engineering option), Botany 2; or general zoology (required for Aquacultural and Fisheries option), Zoology 2	3-5	

Engineering graphics in design, Engineering 4	3	1
Applications of computers, Engineering 5	3	2
Surveying, Civil Engineering 10 (Forest Engineering option; students in other options may petition to substitute technical elective)	3	3
Circuits, Engineering 17	3	5
Statics, Engineering 35	3	6
Properties of materials, Engineering 45	4	4
Expository writing, English 1	4	1
Introduction to public speaking or group communication, Rhetoric or Communication 1 or 3	4	2
Humanities-social sciences electives	8	1-3-6
Total Lower Division Units	96	

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	12	3-4-5
Physics 8D or Microbiology 102 ..	4	6 or 7
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 and Communication 1 or 3	4	2 or 3
Humanities-social sciences electives	16	
Total Lower Division Units	93-97	

Electrical Engineering and Computer Science, Computer Science and Engineering—Lower Division Program IV

	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	3	1 or 2
(Engineering 3 is designed for freshman students. More advanced students may		

petition to substitute 3 units of technical electives for Engineering 3)		
Engineering Computer Science 30	4-8	1 or 2
(Majors in Computer Science and Engineering are required to take Engineering Computer Science 40, 4 units, in addition to course 30. These majors may substitute courses 30H and 40H for courses 30 and 40.)		
Engineering Electrical and Computer Science 70	4	3 or 4
Circuits, Engineering 17	3	5 or 6
Statics, Engineering 35	3	3, 4, or 5
Properties of Materials, Engineering 45	4	4 or 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 and Communication 1 or 3	4	5 or 6
Humanities-social sciences electives	12	
Total Lower Division Units	88-92	

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

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 aero-thermodynamics, 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.

There are a number of electives which could be recommended to all students regardless of their chosen area of specialization. These include:

- Engineering 102L, 105L, 106, 118, 122, 140, 142, 190
- Aeronautical Science and Engineering 131, 132, 137
- Mechanical Engineering 150A, 150B, 163, 172, 173, 184A, 184B, 186, 187

Electrical and Computer Science Engineering 150
Applied Science Engineering 115, Civil Engineering 131A

Suggested advisers:

J.W. Baughn, M. Hafez, R.A. Hess, L.W. Rehfield,
C.P. van Dam, B.R. White.

Aeronautical Science and Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 192.

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B, 104L	13
Applied thermodynamics—Engineering 105A, 105B, Mechanical Engineering 165	10
Fluid mechanics—Engineering 103A, 103B, 103L	7
Aeronautical engineering fundamentals—Aeronautical Science and Engineering 125	3
Aerodynamics—Aeronautical Science and Engineering 126, 127	8
Aircraft propulsion, performance, stability and control—Aeronautical Science and Engineering 128, 129, Mechanical Engineering 162	12
Aircraft preliminary design—Aeronautical Science and Engineering 130	4
Aeronautical structures—Civil Engineering 131B, Aeronautical Science and Engineering 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)	10
Students are urged to consider choosing from Engineering 102L, 105L, 106, 118, 122, 140, 142, 190, Aeronautical Science and Engineering 131, 132, 137, Mechanical Engineering 150A, 150B, 163, 172, 173, 184A, 184B, 186, 187, Electrical and Computer Science Engineering 150, Applied Science 115, Civil Engineering 131A.	
Humanities-social sciences electives	15
Total Units for Upper Division Program	102

Agricultural Engineering

Combine a broad general training in engineering with a basic understanding of biological phenomena and you have the preparation for a socially useful and personally rewarding career.

Agricultural engineers are concerned with systems, equipment and processes for producing, processing, packaging and utilizing biological materials. A cross section of engineering disciplines is integrated with special attention to the interface between physical systems and biological products. Agriculture (including nursery and greenhouse enterprises), food processing and manufacturing, forest production and management, and aquaculture and fisheries all must deal with handling, packaging, storing and transporting biological materials. Agricultural engineering requires an understanding of the properties of these materials. It includes controlling the environment to provide conditions conducive to optimum biological activity and assuring that applied stresses are not damaging or disruptive.

Agricultural engineers often work in interdisciplinary teams with biological scientists and other engineering specialists. Biotechnology, environmental issues, and concerns for the human interface with engineering systems are opening up new and exciting opportunities. Agricultural engineers are needed to harness for the public good the many rapid advances being made in the biological sciences.

The program allows students to select one of four curricula, depending on their specific interests, while

still retaining the versatility and flexibility to adapt to careers in several areas. All programs share a common lower division program and a common core in the upper division. The four curricula are: (1) Agricultural Engineering, a general program offering three possible areas of specialization; (2) Agricultural Engineering (Aquacultural and Fisheries Engineering option); (3) Agricultural Engineering (Food Engineering option); and (4) Agricultural Engineering (Forest Engineering option).

AREAS OF SPECIALIZATION:

Irrigation and Drainage applies engineering and scientific principles in the design and operation of irrigation and drainage systems.

Suggested technical electives:
Agricultural Engineering 140, 141, 143
Atmospheric Science 105
Civil Engineering 142, 144, 145
Water Science 103, 104, 110, 111, 141, 150, 154, 160, 172

Power and Machinery is the design, development and application of machinery and power-units for crop production.

Suggested technical electives:
Agricultural Economics 140
Agricultural Engineering 117, 119
Civil Engineering 131A
Engineering 122, 140
Mechanical Engineering 150A, 150B, 151, 152, 171, 176

Structures and Environment emphasizes the design of agricultural structures for providing an optimum environment for animal production, product storage and conditioning, or crop production in greenhouses.

Suggested technical electives:
Atmospheric Science 20, 105, 124, 133, 149A
Civil Engineering 131A, 131B, 132A, 132B, 132C, 134, 147, 148A, 148B, 149A, 149B
Mechanical Engineering 165
Physiology 110, 149

Agricultural Engineering

(Except Options)

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.)

Upper Division Requirements

Minimum units required for major: 200.

Subject Areas and Courses	UNITS
Electronic circuits and microcomputers—Engineering 100 and Agricultural Engineering 165	8
Applied mechanics and thermodynamics—Engineering 102A, 102B, 103A, 104A, 104B, and 105A	18
Engineering economics—Engineering 106	3
Mathematics—Applied Science 115	3
Agricultural engineering	13
Select four courses from Agricultural Engineering 114, 125, 132 and 140 or 141 or Water Science 160.	
Engineering design	11
(a) Agricultural Engineering 170A, 170B, and 170C.	
(b) Select one course from Civil Engineering 132A, 145, Mechanical Engineering 150A.	
Professional responsibilities—Engineering 190	3
Humanities—social sciences electives	16
Biological and agricultural sciences	16
Select from Agronomy 100, Animal Science 2, Biochemistry and Biophysics 101A, Botany 111A, 111B, Chemistry 88, Entomology 110, Environmental Horticulture 133, Nutrition 115, Physiology 110, 149, Plant Pathology 120, Plant Science 2, 112, 112L, Soil Science 100, 107, 109, Vegetable Crops 101, Water Science 110.	
Required technical	11

Agricultural Engineering 112, Civil Engineering 141, 141L, Engineering 111.	
Technical electives	2
Total Units for Upper Division Program	104

Agricultural Engineering (Aquacultural and Fisheries Engineering Option)

Aquacultural and fisheries engineers are involved in the design, fabrication and management of equipment and facilities for culturing, harvesting and handling aquatic plants and animals. Maintenance of proper habitat and environmental conditions, both in controlled aquaculture operations and in natural fishery settings, is a primary consideration.

Suggested technical electives:
Agricultural Engineering 119, 132
Chemical Engineering 161
Civil Engineering 142, 153
Engineering 105B, 122, 140, 144
Mechanical Engineering 171, 172, 176

Upper Division Requirements

Minimum units required for major: 200.

Subject Areas and Courses	UNITS
Electronic circuits and microcomputers—Engineering 100 and Agricultural Engineering 165	8
Applied mechanics and thermodynamics—Engineering 102A, 102B, 103A, 104A, 104B, and 105A	18
Engineering economics—Engineering 106	3
Mathematics—Applied Science 115	3
Agricultural Engineering	9
Select three courses from Agricultural Engineering 114, 125, 132, and 140 or 141 or Water Science 160.	
Engineering design	11
(a) Agricultural Engineering 170A, 170B and 170C.	
(b) Select one course from Civil Engineering 132A, 145, Mechanical Engineering 150A.	
Professional responsibilities—Engineering 190	3
Humanities—social sciences	16
Biological and agricultural sciences	16
Select from Animal Science 118, Environmental Studies 150A, 151, Wildlife and Fisheries Biology 102, 120, 121, and 122.	
Technical electives	17
Ten units must be selected from Agricultural Engineering Technology 161A, 161B, Agricultural Engineering 112, Civil Engineering 141, 141L, 148A, 148B, Engineering 103B, 111.	
Total Units for Upper Division Program	104

Agricultural Engineering (Food Engineering Option)

Food engineering is the application of engineering principles and concepts to handling, storage, processing, packaging and distribution of food for human consumption. Food engineers play a key role in assisting the food industry to meet the ever increasing demands for high quality foods. The food engineering option is intended to provide a student with an understanding of engineering principles, as well as knowledge of chemical, microbiological, and biochemical characteristics of foods. Concepts such as food storage, refrigeration, drying, freezing, and food manufacturing are studied. Summer internships in California food industry are usually available and students are encouraged to make use of these opportunities.

Suggested technical electives:
Agricultural Engineering 114, 119, 125
Engineering 122, 144
Chemical Engineering 157, 159
Mechanical Engineering 171, 172, 176

Upper Division Requirements

Minimum units required for major: 200.

UNITS

Subject Areas and Courses	
Electronic circuits and microcomputers— Engineering 100 and Agricultural Engineering 165	8
Applied mechanics and thermodynamics— Engineering 102A, 102B, 103A, 104A, 104B, and 105A	18
Engineering economics—Engineering 106	3
Mathematics—Applied Science 115	3
Agricultural Engineering	10
Agricultural Engineering 132, plus two courses from Agricultural Engineering 114, 125, and 140 or 141 or Water Science 160.	11
Engineering Design	11
(a) Agricultural Engineering 170A, 170B and 170C.	
(b) Select one course from Civil Engineering 132A, 145, Mechanical Engineering 150A.	
Professional responsibilities—Engineering 190	3
Humanities—social sciences	16
Biological and agricultural sciences	16
Biochemistry and Biophysics 101A, Chemistry 8B, Food Science and Technology 104, 111, 150 or 151.	
Required technical electives	13
Engineering 103B, 105B, 111, Mechanical Engineering 165.	
Technical electives	3
Total Units for Upper Division Program	104

Agricultural Engineering (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:

Agricultural Engineering 112, 114, 117, 119
Civil Engineering 141, 153
Forest Products 133, 141, 144, 145

Upper Division Requirements

Minimum units required for major: 215.

UNITS

Subject Areas and Courses	
Electronic circuits and microcomputers— Engineering 100 and Agricultural Engineering 165	8
Applied mechanics and thermodynamics— Engineering 102A, 102B, 103A, 104A, 104B, and 105A	18
Engineering economics—Engineering 106	3
Mathematics—Applied Science Engineering 115	3
Agricultural Engineering	9
Select three courses from Agricultural Engineering 114, 125, 132, and 140 or 141 or Water Science 160.	
Engineering design	11
(a) Agricultural Engineering 170A, 170B and 170C.	
(b) Select one course from Civil Engineering 132A, 145, Mechanical Engineering 150A.	

Professional responsibilities—Engineering 190	3
Humanities—social sciences	16
Summer camp	15
Forestry 100A, 100B, 100C, 100D.†	
Biological and agricultural sciences	16
Forestry 120, (or Soil Science 100), 125.† Select seven units from: Forestry 101, 110, 113, Forest Products 132.† (Excess required biological sciences units from the lower division apply.)	
Required technical	13.5
Agricultural Engineering 115, 116, Forestry 102, (or Geography 106), 103.†	
Technical electives	3.5
Total Units for Upper Division Program	119

†Forestry and forest products courses offered only by Berkeley campus.

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 integrated circuits to integrated management of wastes, from food and agricultural chemicals to synthetic polymers. Chemical engineers are increasingly concerned with chemical and engineering processes related to the environment, food and pharmaceutical 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 the student 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, process design, and process dynamics and control. The program is strengthened and broadened with introductory courses in the electrical and mechanical sciences.

The curriculum includes 18 units of technical electives which allow the student to strengthen specific areas in Chemical Engineering, to explore new areas, or to pursue areas of specialization. The most popular areas of specialization, together with lists of suggested technical electives, are identified and discussed in the following paragraphs.

The *premedical* and *prebiomedical engineering* areas of specialization have been specifically designed to prepare the student 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, students are well-prepared to understand similar problems in living systems. Many biological phenomena such as blood flow, solute transport, and energy exchange can be dealt with using the theoretical tools learned as an undergraduate.

AREAS OF SPECIALIZATION:

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 111, 115, 121, 126, 129B, 129C, 130,
131, 150
Textiles 100, 110

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 Engineering 115, 116
Mathematics 118A, 118B, 119, 121A, 121B, 128A,
128B, 128C, 131, 132A, 132B, 160, 164, 185A,
185B

Biochemical Engineering. This area of specialization prepares students to do graduate work in enzyme engineering or biochemical engineering and for employment in the emerging biotechnology industries.

Suggested technical electives:

Strongly recommended

Microbiology 102 (instead of Physics 8D), 102L,
130A, 130B, and 130L

Biochemistry and Biophysics 101A, 101B
Chemical Engineering 161

Recommended

Genetics 100, 102A, 102B, 102L

Biochemistry and Biophysics 101L, 123, 123L,
133

Computers and Automation. This specialization offers the opportunity to master various computational techniques to formulate, solve, and analyze chemical engineering problems. In addition, the student is exposed to the theory and practice of monitoring and operation of chemical processes using microprocessor based control systems. The common ingredient in all these is the use of computers. Development of expert systems for detecting process failures, using computer-aided design (CAD) packages to optimize product yields, solving large number of equations on supercomputers to assess transient behavior of processes and implementation of plantwide control systems are all examples of chemical engineering endeavors based on extensive use of computers. The following list of elective courses is suggested to help the student obtain the necessary background in respective areas.

Suggested technical electives:

(Artificial Intelligence and Computer Graphics)
Computer Science Engineering 165, 170, 175

(Numerical Analysis and Optimization)
Applied Science Engineering 115, 116
Mathematics 128B-C, 131, 132A-B, 168
Civil Engineering 153

(Automatic Control)
Electrical and Computer Science Engineering 150,
151, 157B
Mechanical Engineering 176
Food Science and Technology 156

Electronics Processing. Because the manufacture of semiconductor devices, integrated circuits, and magnetic 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 Science Engineering
115A-115B, 140, 145A, 145B, 145C
Physics 140A, 140B

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

Suggested technical electives:

Agricultural Engineering 112
Engineering 111, 160, 162
Mechanical Engineering 162, 163
Resource Sciences 103

Environmental Engineering. The environmental engineering option 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)

Strongly recommended
Civil Engineering 149A, 149B

Recommended

Atmospheric Science 121A, 121B, 158
Civil Engineering 242A, 242B, 244
Environmental Studies 110
Environmental Toxicology 101, 112A, 112B, 131

(Water Environment)

Strongly recommended

Microbiology 102
Chemical Engineering 161
Civil Engineering 148A, 148B

Recommended

Biochemistry and Biophysics 101A, 101B
Civil Engineering 147, 240, 243A, 243B, 244, 245, 246A, 246B
Environmental Studies 110, 151
Environmental Toxicology 101, 112A, 112B
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:

Strongly recommended

Microbiology 2
Biochemistry and Biophysics 101A, 101B
Chemical Engineering 161
Agricultural Engineering 132
Food Science and Technology 104, 104L, 111

Recommended

Food Science and Technology 150, 150L, 151

Marketing. Specialty chemical and product manufacturers need chemical engineers who have training in market management, which involves the application of economics and statistics in market planning and forecasting, and in strategically developing and promoting new products.

Suggested technical electives:

Management 250, 251
Agricultural Economics 113, 130, 136
Psychology 183
Statistics 103, and 32 or 102

Prebiomedical Engineering. This area of specialization is designed to prepare the student 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, 10, Physiological Sciences 101A, 101B, Physiology 110, 111A, 111B, 112, 113, 114, Zoology 2.

Premedical. Inclusion of both organic and physical chemistry in the curriculum allows the student 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 the Health Sciences Advising Office before making a final decision on electives. To insure that room is provided in the program for the biology courses, it is important to prepare a course schedule with a Chemical Engineering adviser early in the freshman year.

Suggested technical electives:

Anatomy 100
Chemistry 128C, 129B, 129C
Six biology or biochemistry courses, such as Microbiology 2, Biochemistry and Biophysics 101A, 101B, Biological Sciences 1, Genetics 100, 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: 193.

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	58
Chemistry—Chemistry 110A, 110B, 110C	9
Advanced chemistry electives	6
To be selected from upper division courses in Chemistry and Biochemistry and Biophysics, Chemical Engineering 161, 163, Civil Engineering 148A, 149A, Engineering 134, 144, 147, Environmental Toxicology 112A-112B, Food Science and Technology 100A-100B, 101A-101B, 104, 111, 119, Physiological Sciences 101A-101B.	
Technical electives	12
Humanities-social sciences electives	8
Total Units for Upper Division Program	100

Chemical Engineering/Materials Science and Engineering

Minimum units required for major: 200.

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	58
Chemistry—Chemistry 110A, 110B, 110C	9
Materials science—Engineering 130, 132, 134, 136, and two courses chosen from Engineering 140, 142, 144, 147, and three laboratory courses chosen from 132L, 134L, 138L, 140L, and 144L	21
Humanities-social sciences electives	8
Total Units for Upper Division Program	103

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 required. While developing your individual program, you are urged to consult a faculty adviser.

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 Sociology 143. Other technical electives of possible interest to majors in all five of the areas of specialization are Applied Science Engineering 115 and Engineering 180. Additional information concerning the areas of specialization and suggested courses are given in the following paragraphs.

AREAS OF SPECIALIZATION:

Civil Engineering Planning. Specialization in this area is directed toward planning of resources utilization and development of projects on an urban or regional scale. Civil engineering planning requires an understanding of the basic principles of engineering, economics, law, planning concepts and techniques, environmental sciences, public administration, and politics. You are encouraged to plan your program early with the aid of a faculty adviser and to complement the suggested technical electives with courses in the humanities and social sciences.

Suggested technical electives:

Agricultural Economics 147, 148, 176
Civil Engineering 137, 143, 146, 152, 153, 160, 161, 162
Economics 125A, 125B, 130, 131
Engineering 160
Environmental Studies 160, 161, 165, 167, 168A, 168B, 169, 171, 173, 179
Geography 155, 162
Geology 134
Political Science 100, 101, 102, 107, 108
Water Science 150, 154

Suggested advisers:

R. Kitamura, D. Sperling, J.R. Lund.

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 Engineering 115
Atmospheric Science 120, 121A, 121B, 158
Microbiology 102, 105, 130A
Biochemistry and Biophysics 101A, 101B
Chemical Engineering 154A, 154B, 156A, 156B
Chemistry 107A, 107B, 110A, 128A, 128B
Civil Engineering 143, 145, 146, 147, 148B, 149A, 149B, 152
Engineering 118, 180
Environmental Studies 150A, 150B, 150C, 151, 166
Mathematics 128A, 128B, 128C
Statistics 130A, 130B

Suggested advisers:

D.P.Y. Chang, G.T. Orlob, O.G. Raabe, E.D. Schroeder, G. Tchobanoglous.

Structural Engineering, Structural Mechanics, and Geotechnical Engineering. This area is con-

cerned with conception, design, analysis, economics, and construction of structures such as buildings, bridges, highways, and dams. Structural Engineering encompasses structures made from materials such as metals, reinforced concrete or timber. Geotechnical Engineering encompasses natural and man-made types of structure such as foundations or slopes which are composed of rock or soil. Structural mechanics emphasizes more theoretical aspects—such as mathematical analysis and characterization of material properties.

Suggested technical electives:

- Applied Science Engineering 115
- Art 121A
- Civil Engineering 131B, 132A, 132C, 133, 134, 137, 138, 139, 162, 173, 175, 177
- Engineering 122, 138, 180
- Mathematics 128A, 128B, 128C

Suggested advisers:

- K. Arulanandan, D.O. Brush, J.A. Cheney, Y.F. Dafalias, L.R. Herrmann, J.R. Hutchinson, B. Kutter, K.D. Mish, M.R. Ramey, K.M. Romstad, C. Shen, M.A. Taylor.

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:

- Civil Engineering 137, 149A, 149B, 152, 153, 160, 161, 162
- Engineering 118, 160
- Environmental Studies 167, 168A, 168B, 171, 173, 178, 179

Suggested advisers:

- R. Kitamura, D. Sperling.

Water Resources Engineering. This area includes hydrology, hydraulics, and water resources systems planning and design. Hydraulics is concerned with flow in pipe and open-channel water-distribution systems and through hydraulic structures. Water resources 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 Science Engineering 112, 151
- Environmental Studies 128, 150A, 151
- Geography 162
- Water Science 103, 110, 111, 150, 160

Suggested advisers:

- M.L. Kavvas, I. King, B.E. Larock, J.R. Lund, M.A. Mariño, G.T. Orlob, V.H. Scott.

Civil 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 or 111	3-4†
Applied mechanics—Engineering 102A, 103A, 104A, 104L	10
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	7
Environmental—Civil Engineering 148A	3
Civil engineering design—Civil Engineering 132B; plus any five courses from Civil Engineering 132A, 132C, 134, 139, 145, 147, 148B, 152, 162, 173 (must include one from courses 134, 145, 148B, 162, or 173)	18
Economics—Engineering 106	3
Engineering mathematical analysis—Applied Science Engineering 115; Civil Engineering 114, and either Applied Science Engineering 116, Civil Engineering 131B or 153	9
Transportation electives—select from Civil Engineering 160, 161, or 162	3
Technical electives	9†
Six of these units must be selected from engineering courses.	
Humanities-social sciences electives	11
Total Units for Upper Division Program	90

Civil Engineering/Materials Science and Engineering

Minimum units required for major: 184.

Subject Areas and Courses	UNITS
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 103A, 104A, 104L	10
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	7
Environmental—Civil Engineering 148A	3
Civil engineering design—Civil Engineering 132B; plus any three courses from Civil Engineering 132A, 132C, 134, 139, 145, 147, 148B, 152, 162, 173 (must include one from Civil Engineering 134, 145, 148B, 162 or 173)	12
Economics—Engineering 106	3
Engineering mathematics analysis—Applied Science Engineering 115; Civil Engineering 114, and either Applied Science Engineering 116 or Civil Engineering 131B or 153	9
Materials science, Engineering 132, 132L, 134, 134L, 138, 138L, and two courses from Engineering 140, 142, 144, 147, or Civil Engineering 133	18
Humanities-social sciences electives	11
(Civil Engineering 137 recommended.)	
Total Units for Upper Division Program	94

Electrical and Computer Science Engineering

(See also Computer Science)

Electrical engineering is a very broad field encompassing enormous variety. The common thread is electromagnetic signals and energy. Electrical engineering is concerned with the generation, the shaping, and the use of electromagnetic signals and energy. These range from DC (direct current) through 60-cycle power to radio and microwave frequency signals, and even to optical frequencies. Methods of generation include power generators, microwave oscillators, and even lasers. Shaping of signals may be digital and analog modulation through the use of various electronic components and circuits, including solid-state microelectronics. The use of electromagnetic signals encompasses communi-

†One unit of Engineering 100 applies toward the Technical electives requirement.

‡Students should be aware that Civil Engineering 10 is a required prerequisite to course 172.

cations, information storage, and processing as well as control and even robotics.

The undergraduate program of the electrical engineering curriculum provides the student with a strong background for the understanding, use, and design of the various aspects and components of electrical engineering. It also provides a sufficient background for higher level studies aimed towards a research or teaching career. The first two years are primarily devoted to fundamental concepts. Some of these are common to all Engineering programs, but already in the first two years some specialization towards electrical engineering is provided. The third and fourth years are devoted to essential electrical engineering subjects. There is a common set of core courses that give a basis for any area of the enormous, wide field of electrical engineering. Especially during the senior year through the choice of various technical electives, there is also the opportunity to specialize to some extent in one or more sub areas. Majors have a fair amount of freedom to choose a somewhat narrower but more in-depth study or a broader more general one. Specific areas of specialization are difficult to categorize into groups. Examples are: circuits and electronics, signal processing, control and automation, solid-state and microelectronics, microwaves, and quantum electronics. Individual courses give brief descriptions. The required core courses are so designed as to give some knowledge of not one but several of these speciality areas. (Core and departmental course listings follow the Engineering major programs section.)

The extent of further specialization is chosen by the student with the help of departmental advisers.

The Computer Science and Engineering curriculum has requirements and strengths in engineering and computer fundamentals and architecture and computer software. The curriculum provides background in basic programming skills, computer architecture, electronic circuits, electromagnetics, physical electronics, digital design, programming languages, operating systems, software engineering, computer science theory, mathematics, physics, chemistry. Electives allow students to develop strong concentration in computer hardware or software. 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.

Electrical 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
Mathematics, any upper division mathematics or statistics course (except Mathematics 101 or Statistics 102)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A	6
Circuits, systems and electronics—Engineering 100, Electrical and Computer Science Engineering 110A, 110B, 111A, 111B, 112	16
Core requirements—select nine units from Electrical and Computer Science Engineering 131A, 145A, 151, 157A, 160, 171	9
Electromagnetic fields and physical electronics—Electrical and Computer Science Engineering 130A, 130B, 140	10
Design electives—select six courses, at least one course with a laboratory, from Electrical and Computer Science Engineering 114A, 114B, 115A, 115B, 132A, 132B, 150, 157B, 161, 172, 175, 176, 177, 182A, 182B, Computer Science Engineering 110, 142, 165, 168, (may include a 192 and 199 course with adviser's approval)	18
Additional technical electives	15
Humanities-social sciences electives	12
Total Units for Upper Division Program	92

Computer Science and Engineering

Minimum units required for major: 186.

	UNITS
Subject Areas and Courses	
Discrete structures and probability—Computer Science Engineering 100, plus one course from Statistics 131A, Mathematics 131, or Engineering 118	6
Engineering science—Engineering 102A, 105A	6
Circuits, systems, and electronics—Engineering 100, Electrical and Computer Science Engineering 110A, 110B, 111A, 111B, 112	16
Electromagnetic fields and physical electronics—Electrical and Computer Science Engineering 139, 140	8
Computer hardware—Electrical and Computer Science Engineering 171, 176	8
Computer science theory—Computer Science Engineering 110, plus Computer Science Engineering 120 or 122	7
Those planning to take Computer Science Engineering 142 as an elective should elect Computer Science Engineering 120	
Computer software—Computer Science Engineering 140, 150, 160	12
Computer electives	9
Hardware emphasis—select courses from Electrical and Computer Science Engineering 114A, 114B, 151, 172, 175, 177	
Software emphasis—select courses from Computer Science Engineering 120, 122, 142, 165, 168, 170, 175, Electrical and Computer Science Engineering 182A, 182B	
Technical electives	10
Humanities-social sciences electives	12
Total Units for Upper Division Program	94

Electrical Engineering/Materials Science and Engineering

Minimum units required for major: 186.

	UNITS
Subject Areas and Courses	
Mathematics, any upper division mathematics or statistics course (except Statistics 102)	3
Professional responsibilities—Engineering 190	3
Engineering science—Engineering 102A, 105A	6
Laboratory elective—one upper division course with materials science laboratory—select from Electrical and Computer Science Engineering 115A, 115B, Engineering 149 or Electrical and Computer Science Engineering 199	3
Circuits, systems and electronics—Engineering 100, Electrical and Computer Science Engineering 110A, 110B, 111A, 111B, 112	16
Electromagnetic fields and physical electronics—Electrical and Computer Science Engineering 130A, 130B, 140	10
Design electives—select four courses from Electrical and Computer Science Engineering 115A, 115B, 145A, 145B, 145C, 175	12
Materials science—Engineering 132, 132L, 134, 134L, 138, 138L, and two courses from Engineering 140, 142, 144, 147 or Electrical and Computer Science Engineering 148	18
Thermodynamics—Engineering 130, Physics 140A	6
Core requirement—select nine units from Electrical and Computer Science Engineering 131A, 145A, 151, 157A, 160, 171	9
Humanities—social sciences electives	12
Total Units for Upper Division Program	98

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 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 are basic to engineering. These courses, taken during the first two years, provide a strong foundation in fundamental engineering concepts. The 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" course (Engineering 130, 132, 134, 138). With this background in hand, you are then ready for the "applications" courses (Engineering 140, 142, 144, 146, 147, 149) 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 provide preparation for research in a selected area at the graduate level.

Seventeen technical elective units may be selected to complete the undergraduate Materials Science and Engineering program. By selecting the appropriate technical electives and humanities and social science electives, you may orient the program to suit your interests and career objectives. Examples include production and development, applied research, basic research, teaching, and management.

Upper-division courses in engineering, chemistry, physics, mathematics, and biological sciences are generally acceptable as technical electives.

The following technical elective courses and the suggested areas of specialization are 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 171, 172, 173, 185
 Electrical and Computer Science 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 Engineering 115
 Computer Science Engineering 110, 122, 142
 Electrical and Computer Science Engineering 171, 172, 175, 176, 177, 182A, 182B

- Mathematics 128A, 128B, 168
 Statistics 130A, 130B

- Electronic Materials:**
 Electrical and Computer Science Engineering 130A, 130B, 140, 145A, 145B, 145C, 148
 Physics 121

- Environmental Engineering:**
 Engineering 160
 Atmospheric Science 120
 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, 185
 Civil Engineering 137

- Physics of Solids:**
 Physics 115A, 115B, 140A, 140B
 Electrical and Computer Science Engineering 145A, 145B, 145C, 148

- Suggested advisers:**
 J.C. Gibeling, D.G. Howitt, A.K. Mukherjee, Z.A. Munir, J. F. Shackelford.

Materials Science and Engineering

Minimum units required for major: 183.

	UNITS
Subject Areas and Courses	
Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 103A, 104A	9
Applied thermodynamics—Engineering 105A, 130	6
Materials in design—Engineering 140, 149	6
Measurements and laboratory—Engineering 132L, 134L, 138L, 140L, 142L, 144L; Mechanical Engineering 176	9
Materials science—Engineering 132, 134, 138, 142, 144, 147	16
Applied mathematics—Engineering 180	3
Basic science—Chemistry 110A and 110C or Physics 140A-140B	6
Technical electives	17
Humanities-social sciences electives	15
Total Units for Upper Division Program	93

Mechanical Engineering

The modern mechanical engineer uses basic science in the design and manufacture of complex engineering systems. This requires the application of physical and mechanical principles in the development of machines, energy conversion systems, materials, and equipment for guidance and control.

Preparation for this broad field of engineering requires a thorough knowledge of mathematics, physics, chemistry, fluid mechanics, thermodynamics, heat transfer, mass transfer, electricity, manufacturing processes, properties of materials, and economics.

The Mechanical Engineering curriculum is based on a common core of engineering courses taken in the first two years. The third year is spent in further study of fundamental courses, and in the fourth year you may tailor your studies to your own interests by selecting courses in controls and systems analysis, fluid mechanics, heat transfer, thermodynamics, mechanical design, and materials science. You can prepare either for graduate study in Mechanical Engineering or obtain a broad background for entering engineering practice at the bachelor's level.

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

AREAS OF SPECIALIZATION:

Creative Design. The creation and improvement of products, processes, or systems which are mechanical in nature are the primary goals of a pro-

essional 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:

Aeronautical Science and Engineering 130
Agricultural Engineering 119, 165
Applied Science Engineering 115
Civil Engineering 131B
Engineering 111, 118, 122, 140, 142, 160
Mechanical Engineering 134, 150B, 151, 152, 162, 172, 173, 184A, 184B, 185, 188

Suggested advisers:

C.W. Beadle, A.A. Frank, J.M. Henderson, M.L. Hull, B. Ravani, 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 162, 163, 186

Suggested advisers:

J.W. Baughn, H. Brandt, H.A. Dwyer, M.A. Hoffman, I. Kennedy, W. Kollmann, C.K. Law, 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.

Graduate research includes projects on continuously variable transmissions, active and semi-active suspension systems, anti-skid braking systems, electromechanical actuator design, design and control of walking machines, electronically controlled steering, mathematical models of motorcycle dynamics, and the analysis of fuel management systems.

An Automotive System Dynamics Laboratory is being developed for testing components such as engines, transmissions, brakes, and steering systems as well as completing test vehicles. As plans for on-campus laboratories and a test track proceed, ten experimental vehicles are housed in a rented facility and research on vehicle components proceeds in various Mechanical Engineering laboratories.

Suggested technical electives:

Aeronautical Science and Engineering 128, 129, 131
Mechanical Engineering 134, 152, 172, 173, 184A, 184B
Engineering 122

Suggested Advisers:

J.W. Brewer, A.A. Frank, R.A. Hess, 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:

Aeronautical Science and Engineering 127, 128, 129
Civil Engineering 131A, 149A, 149B, 160
Engineering 122, 160
Mechanical Engineering 134, 152, 162, 163, 172, 173

Suggested advisers:

A.A. Frank, M. Hubbard, D.C. Karnopp, D.L. Margolis.

Mechanical Engineering

(Accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc.)

Minimum units required for major: 186.

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	10
Fluid mechanics—Engineering 103A, 103B	6
Mechanical engineering design—Mechanical Engineering 150A, 150B or 172, and one course from 184A-184B, 185, 186, 187, 188	12
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
Select 12 of the 21 units from upper division Engineering (core) or Mechanical Engineering courses. In order to satisfy design requirements, three courses (of the 12 units) must be selected from the following: Engineering 122, 140, Aeronautical Science and Engineering 129, 130, Mechanical Engineering 150B, 172, 184A-184B, 185, 186, 187, 188 (courses not used for design units above), 134, 151, 152, 162.	
Humanities-social sciences electives	15

Total Units for Upper Division Program 96

Mechanical Engineering/Materials Science and Engineering

Minimum units required for major: 192.

Subject Areas and Courses

Electronic circuits—Engineering 100	4
Applied mechanics—Engineering 102A, 102B, 104A, 104B	12
Applied thermodynamics—Engineering 105A, 105B, 130; Mechanical Engineering 165	13

Fluid mechanics—Engineering 103A, 103B	6
Mechanical engineering design—Mechanical Engineering 150A, 150B, or 172, and one course from 184A-184B, 185, 186, 187, 188	12
Controls and systems analysis—Mechanical Engineering 171	4
Materials science—Engineering 132, 132L, 134, 134L, 138, 138L, and two courses from Engineering 140, 142, 144, 147	18
Measurements and laboratory—Engineering 102L, 103L, 105L, Mechanical Engineering 176	6
Applied mathematics—Engineering 180	3
Professional responsibilities—Engineering 190	3
Technical electives	6
In order to satisfy design requirement, two courses must be chosen from Aeronautical Science and Engineering 129, 130, Engineering 140, 149, Mechanical Engineering 150B, 172, 184A-184B, 185, 186, 187, 188. (courses not used for design units above), 134, 151, 152, 162.	
Humanities-social sciences electives	15

Total Units for Upper Division Program 102

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 under Individual Major in the Programs and Courses section of this catalog.)

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. Introduction to the engineering profession. General view of the engineering process as obtained by participation in laboratory experiments illustrative of the solution of representative, but greatly simplified, engineering problems. (P/NP grading only.)

4. Engineering Graphics in Design (3) I, II. Beadle, Kemper
Lecture—2 hours; laboratory—3 hours. Prerequisite: 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) I, II, III. The Staff
Lecture—2 hours; discussion—1 hour. Prerequisite: Mathematics 16A or 21A. Not intended for Electrical Engineering or Computer Science Engineering majors. Digital computation and computer programming in FORTRAN. Algorithms and their description. Basic programming; debugging of programs; approximate computing-accuracy and significance; solving simple numerical and nonnumerical problems. Students who complete this course or the equivalent, and transfer into an Electrical Engineering or Computer Science Engineering major, should take the Engineering 5-Computer Science Engineering 32 sequence as opposed to the Engineering Computer Science 30-40 sequence.

17. Circuits (3) I, II, III. The Staff
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 choices. Intended primarily for students who are not engineering or science majors. Engineering or physical science students may receive only 2 units of credit. General Education credit: Nature and Environment/Introductory.

35. Statics (3) I, II, III. The Staff (Shen 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
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 (Henderson 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) I, II, III. The Staff (Henderson in charge)
Lecture—3 hours. Prerequisite: course 102A. Topics in three-dimensional rigid-body dynamics; elementary dynamics of vibrating systems; introduction to energy methods.

102L. Dynamics Laboratory (1) II, III. The Staff (Beadle in charge)
Lecture—1 hour; laboratory—1 hour. 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 (Brandt 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) I, II, III. The Staff (Brandt in charge)
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. White
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.) Not open for credit to students who have completed Civil Engineering 141L.

104A. Mechanics of Materials (3) I, II. The Staff (Shen in charge)
Lecture—3 hours. Prerequisite: course 35; Mathematics 22B. Open to Engineering students only. Uniaxial loading and deformation; general concepts of stress-strain-temperature relations and yield criteria; stresses in thin-walled pressure vessels; torsion of shafts; bending of symmetrical beams.

104B. Mechanics of Materials (3) II, III. The Staff (Shen in charge)
Lecture—3 hours. Prerequisite: course 104A. Open to Engineering students only. Deflections due to bending of beams, unsymmetrical bending; application of energy methods to bending problems; yielding and plastic deformation in beams, limit analysis; buckling of columns.

104L. Mechanics of Materials Laboratory (1) II, III. Hutchinson
Laboratory—3 hours. Prerequisite: course 104B (may be taken concurrently). Experiments which illustrate the basic principles and verify the analysis procedures used in the mechanics of materials are performed using the basic tools and techniques of experimental stress analysis.

105A. Thermodynamics (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: Mathematics 22B, 22C. Fundamental concepts of thermodynamics, heat energy and work, properties of pure substances, First Law and Second Law for closed and open systems, reversibility, entropy, thermodynamic temperature scales. Power cycles; Carnot, Rankine, Brayton, and applications of thermodynamics to engineering systems.

105B. Thermodynamics (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 105A. Irreversibility and availability, thermodynamic relations, gas and vapor mixtures and chemical reactions.

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 principles of state, the first and second laws of thermodynamics, and thermodynamic cycles. (P/NP grading only.)

106. Engineering Economics (3) II, III. Hartsough, McCarthy
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) II, III. Hartsough, 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
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, semiconductor, thermoelectric power and thermionic energy conversion.

132. Structure of Engineering Materials (3) I. Howitt
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.

132L. Structure of Materials Laboratory (1) I. Howitt
Laboratory—3 hours. Prerequisite: course 132 concurrently. Experimental investigations of the structure of solid materials. Laboratory exercises emphasize methods used to study structure of solids at atomic and microstructural levels.

134. Rate Processes in Materials Science (3) III. The Staff
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.

134L. Rate Processes in Materials Laboratory (1) III. The Staff
Laboratory—3 hours. Prerequisite: course 134 concurrently. Laboratory experiments to illustrate fundamental principles of diffusion, solidification, recrystallization, precipitation, evaporation, sintering and phase transformations in materials.

138. Mechanical Behavior of Materials (3) II. Mukherjee
Lecture—3 hours. Prerequisite: 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.

138L. Mechanical Properties Laboratory (1) II. Mukherjee
Laboratory—3 hours. Prerequisite: course 138 concurrently. Experimental investigations of mechanical behavior of materials. Laboratory exercises emphasize fundamental relationships between microstructure and mechanical properties.

140. Materials in Engineering Design (3) III. Gibeling
Lecture—3 hours. Prerequisite: senior standing in Engineering or consent of instructor. Descriptive treatment of common engineering materials. Discussion of design parameters of typical materials 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.

140L. Materials Selection Laboratory (1) III. Gibeling
Laboratory—3 hours. Prerequisite: course 140 concurrently. Experimental investigations of processing and properties of materials used in structural applications. Laboratory exercises emphasize fundamental relationships between microstructure and properties. Consideration given to the role of property control in materials selection.

142. Principles of Nondestructive Testing (3) II. Shackelford
Lecture—3 hours. Prerequisite: senior standing in Engineering or consent of instructor. Basic principles of nondestructive testing using radiological, ultrasonic, electrical, magnetic, penetrant methods, etc., are discussed. Typical results expected from these tests and their application in material characterization, flaw detection, crystallographic information, chemical inhomogeneity, residual stress analysis, etc., are emphasized.

142L. Nondestructive Testing Laboratory (1) II. Shackelford
Laboratory—3 hours. Prerequisite: course 142 concurrently. Laboratory experience in non-destructive testing techniques with emphasis on X-ray radiography, X-ray diffraction, and ultrasonics.

144. Corrosion and Oxidation of Engineering Materials (3) I. The Staff

Lecture—3 hours. Prerequisite: upper division standing in Engineering. Principles governing the interaction between engineering materials and their environment; corrosion in aqueous media, soils and biological systems. Oxidation of structural materials in high temperature applications; design and selection criteria for the prevention and control of corrosion.

144L. Corrosion Laboratory (1) I. The Staff
Laboratory—3 hours. Prerequisite: course 144 concurrently. Laboratory experiments to demonstrate corrosion behavior of materials in aqueous and high temperature environments. Relationship between corrosion behavior and fundamental principles and theories emphasized.

147. Principles of Polymer Materials Science (3) II. 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.)

149. Materials Engineering Design Project (3) I, II, III. The Staff

Laboratory—9 hours. Prerequisite: consent of instructor; course 140 recommended (may be taken concurrently). A capstone engineering design experience involving analysis of real materials processes or engineering materials problems. The various principles of materials science introduced in other courses in the curriculum are integrated into the design project.

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. Offered in even numbered years. (Lower division students are referred to Resource Sciences 3.)

162. Advanced Energy Technology (4) I. Craig
Lecture—3 hours; discussion—1 hour. Prerequisite: course 105A or consent of instructor. Technical overview of energy technologies. Emphasis on semiquantitative understanding. About 20 percent of course is policy oriented. Designed to mesh with course 160, which is primarily policy. (P/NP grading only.) Offered in odd numbered years.

180. Engineering Analysis (3) I, III. Hafez, 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; laboratory—1 hour. 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. 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)

Henry E. Studer, M.S., Chairperson of the Department

Department Office, 2030 Bainer Hall (752-0102)

Faculty

Norman B. Akesson, M.S., Professor Emeritus
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
Michael J. Delwiche, Ph.D., Associate Professor
Roger E. Garrett, Ph.D., Professor

D. Ken Giles, Ph.D., Assistant Professor
 John R. Goss, M.S., Professor
 Mark E. Grismer, Ph.D., Assistant Professor
 (*Agricultural Engineering, Water Science*)
 Bruce Hartsough, Ph.D., Assistant Professor
 S. Milton Henderson, M.S., Sc.D., Professor
 Emeritus

David J. Hills, Ph.D., Professor
 Bryan M. Jenkins, Ph.D., Associate Professor
 Robert A. Kepner, B.S., Professor Emeritus
 Coby Lorenzen, Jr., M.S., Professor Emeritus
 Miguel A. Marinó, Ph.D., Professor
 Michael J. McCarthy, Ph.D., Assistant Professor
 R. Larry Merson, Ph.D., Professor
 John A. Miles, Ph.D., Professor
 Stanton R. Morrison, Ph.D., Professor Emeritus
 Loren W. Neubauer, Ph.D., Professor Emeritus
 Michael O'Brien, Ph.D., Professor Emeritus
 Raul Piedrahita, Ph.D., Assistant Professor
 James W. Rumsey, M.S., Assistant Professor
 Thomas R. Rumsey, Ph.D., Associate Professor
 Verne H. Scott, Ph.D., Professor
 R. Paul Singh, Ph.D., Professor
 Henry E. Studer, M.S., Professor
 Shrinivasa K. Upadhyaya, Ph.D., Associate
 Professor
 Wesley W. Wallender, Ph.D., Associate Professor
 Wesley E. Yates, M.S., Professor Emeritus

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. Hartsough
 Discussion-laboratory—3 hours. Introduction to the engineering aspects of forestry problems, including nursery operations, reforestation, harvesting, log transport, milling and residue utilization. (P/NP grading only.)
- 65. Introduction to Microcomputers and Data Acquisition Systems** (1) III. Jenkins, Singh
 Discussion—1 hour; laboratory—1 hour. Prerequisite: Engineering 5 or the equivalent. Operation and programming of microcomputers for problem solving and data acquisition. Introduction to microcomputers, peripherals, interfaces, sensors, data acquisition systems, and data handling and manipulation programs.
- 92. Internship in Agricultural Engineering** (1-5) I, II, III. The Staff (Studer in charge)
 Work-learn experience. Prerequisite: lower division standing; project approval 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 (Studer 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 (Studer 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) III. Hartsough
 Lecture—3 hours. Prerequisite: Civil Engineering 10, Engineering 102A and 104A; Forestry and Resource Management 100A, 100B, 100C, 100D (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) I, Miles
 Lecture—1 hour; three weekend field trips to Blodgett Forest. Prerequisite: course 114 or 115. A field study and critical analysis of operations, techniques, and equipment common in forest management, with particular consideration to measurements, data analysis, safety of operations, and maintenance practices.
- 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 Systems** (3) III. Chen
 Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 103A. Principles of operation, characteristics, testing and selection of hydraulic system components: pumps, motors, cylinders, control elements and accessories. Design and analysis of hydraulic systems.
- 125. Agricultural Structures: Environmental Aspects** (3) II. Jenkins
 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.
- 132. Unit Operations in Food Engineering** (4) III. Singh, T. Rumsey
 Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103A, 105A. Mechanical unit operations applied to such processes as non-Newtonian flow, size reduction, sorting and mixing of granular materials. Thermal operations related to refrigeration, freezing, evaporation and drying of foods.
- 140. Seepage and Drainage** (3) III. Grismer
 Lecture—3 hours. Prerequisite: Engineering 103A or Water Science 142. Flow through porous media; measurement of hydraulic conductivity; seepage under hydraulic structures; anisotropy flow nets; drainage design for water table and salt control. (Same course as Water Science 140.)
- 141. Sprinkler Irrigation Design** (3) II. Wallender
 Lecture—3 hours. Prerequisite: Engineering 103A. Engineering and scientific principles applied in design of sprinkler irrigation systems for farms. Pumping plants, pipe hydraulics, sprinkler characteristics and irrigation machines.
- 143. Micro-Irrigation Design** (2) II. Hills
 Lecture—2 hours. Prerequisite: Engineering 103A. Engineering and scientific principles applied in design of micro-irrigation systems for farms. Water treatment, pipe hydraulics, emitter characteristics, specialized hardware associated with micro systems.
- 165. Microcomputer Applications in Agriculture** (4) I, Delwiche
 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, 132, Civil Engineering 145, Mechanical Engineering 150A, Water Science 160. 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 Projects: Design** (3) II. Miles
 Laboratory-discussion—three 2-hour sessions. Prerequisite: course 170A. Individual or group projects involving the design of devices, structures, or systems to solve specific problems in agriculture or forestry. Students may select their projects, subject to approval of instructor.
- 170C. Engineering Projects: Design Evaluation** (3) 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 (Studer 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 (Studer in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)
- 199. Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Studer 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.
- 216. Energy Systems in Agriculture** (3) III. Jenkins
 Lecture—3 hours. Prerequisite: Engineering 105A. Theory and application of energy systems in agriculture. Analysis of energy transformation processes and optimal systems design utilizing stock and flow energy resources. Offered in even-numbered years.
- 220. Pilot Plant Operations in Aquacultural Engineering** (3) III. Piedrahita
 Lecture—1 hour; laboratory—6 hours. Prerequisite: Civil Engineering 243A-243B or Agricultural Engineering Technology 161A-161B. Topics in water treatment as they apply to aquaculture operations. Laboratory study of unit operations in aquaculture. Offered in even-numbered years.
- 235. Advanced Unit Operations in Process and Food Engineering** (3) II. T. Rumsey
 Lecture—2 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.
- 240. Infiltration and Drainage** (3) II. Grismer
 Lecture—3 hours. Prerequisite: Soil Science 107; course 140; Water Science 140. Aspects of multiphase flow in soils and their application to infiltration and drainage. Gas phase transport and entrapment during infiltration, and transient drainage with nonlinearity, capillarity, and evapotranspiration considered. Offered in odd-numbered years. (Same course as Water Science 240.)
- 241. Sprinkler and Trickle Irrigation Systems** (3) III. Hills
 Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 141 and 143. Computerized design of sprinkler and trickle irrigation systems. Techniques for field evaluation of pressurized irrigation systems. Incorporation of water treatment, chemigation, and automation in these systems.
- 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—3 hours. Animal, crop and food processing wastes; pesticides, fertilizers, odors, dust and smoke in relation to environmental pollution. Disposal needs, present and future. Regulation, economics and public concern; coordination with municipal and industrial wastes management. Offered in even-numbered years.
- 250. Design of Mechanical Systems** (2) I, Giles
 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. Upadhyaya
 Lecture—3 hours; laboratory—3 hours. Prerequisite: at least one undergraduate course in statistics or consent of instructor. Design, management, and analysis of engineering experiments with emphasis on criteria for the selection and utilization of statistical methods. Problems necessitating the use of campus and departmental computing facilities will be assigned.
- 270. Modeling and Analysis of Biological and Physical Systems** (3) III. Upadhyaya, Rumsey
 Lecture—3 hours. Prerequisite: Civil Engineering 212A. Mathematical modeling of biological systems: model development; analytical and numerical solutions. Case studies from various specializations within Agricultural Engineering. Offered in odd-numbered years.

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 (Studer 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. The Staff (Studer in charge)
Seminar—1 hour. (S/U grading only.)

290C. Graduate Research Conference (1) I, II, III. The Staff (Studer in charge)
Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress and techniques in agricultural engineering. May be repeated for credit. (S/U grading only.)

297. Advances in Food Engineering (1) I, II, III. Singh Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in food engineering. Presentations by individual students. (S/U grading only.)

297T. Supervised Teaching in Agricultural Engineering (1-3) I, II, III. The Staff
Laboratory—3 hours; tutorial—3-9 hours. Prerequisite: graduate standing; consent of instructor. Tutoring and teaching students in undergraduate courses offered in the Department of Agricultural Engineering. Weekly conferences with instructor, evaluation of teaching. Preparing for and conducting demonstrations, laboratories and discussions. Preparing and grading exams. May be repeated for a total of 6 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Studer in charge)

299. Research (1-12) I, II, III. The Staff (Studer in charge) (S/U grading only.)

Wilson K. Talley, Ph.D., Professor
Edward Teller, Ph.D., University Professor Emeritus
Rao Vemuri, Ph.D., Professor
Richard W. Watson, Ph.D., Lecturer
Frederick Wooten, Ph.D., Professor
Yin Yeh, Ph.D., Professor

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; course 137 concurrently. Intended for students in letters. Course will emphasize the physics concepts of course 137. No credit allowed to students who have had any other physics course. (Same course as Physics 37.)

98. Directed Group Study (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor and lower division standing. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

115. Introduction to Numerical Methods for Engineers and Scientists (3) I, II, III. The Staff (Wooten in charge)
Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Introduction to error analysis, roots of equations, interpolation, quadrature, eigenproblems, systems of linear algebraic equations, ordinary differential equations, and deterministic and stochastic algorithms. Lectures and computational assignments on the application of digital computers to problems in engineering and science.

116. Computer Solution of Physical Problems (3) II. De Groot Lecture—3 hours. Prerequisite: course 115 or consent of instructor. Application of computers to solution of physical problems. Numerical solution of elliptic, parabolic, and hyperbolic partial differential equations; eigenvalue problems, Monte Carlo methods, linear programming.

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, 6C, 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.) General Education credit: Nature and Environment/ Non-Introductory. Recommended GE prerequisite: Physics 10.

147. Arms Race Technologies and Strategies (3) I, Craig Lecture—2 hours; discussion—1 hour. Prerequisite: course 137 or Physics 137. Technological and strategic issues in the nuclear arms race. Characteristics of nuclear weapons and weapons defense systems; responses and counter-responses. Advantages and disadvantages of alternative realizations of weapons systems. Offered in odd-numbered years.

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.

180. Introduction to Plasma Physics and Controlled Fusion (3) I, De Groot Lecture—3 hours. Prerequisite: Physics 110B and 112A, or consent of instructor. Equilibrium plasma properties, plasma sources, plasma diagnostics, magnetohydrodynamics, kinetic theory, plasma stability, plasma confinement systems and approaches to controlled thermonuclear fusion.

181. Plasma Physics Laboratory (1) I, De Groot Laboratory—3 hours. Prerequisite: course 180 (concurrently). Langmuir probes, plasma sources, Landau damping of ion acoustic waves, ion acoustic shocks, ion-ion two-stream instability.

198. Group Study (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor. (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

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. Newcomb Lecture—3 hours. Prerequisite: Electrical and Computer Science 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. De Groot Lecture—3 hours. Prerequisite: course 234B or consent of instructor. Equilibrium plasma properties; single particle motion; fluid equations; waves and instabilities in a fluid plasma; plasma kinetic theory and transport coefficients; linear and nonlinear Vlasov theory; fluctuations, correlations and radiation; inertial and magnetic confinement systems in controlled fusion.

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) (S/U grading only.)

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. Intro-

Engineering: Applied Science

(College of Engineering)

Frederick Wooten, Ph.D., Chairperson of the Department

Yin Yeh, Ph.D., Vice Chairperson of the Department

Department Office, 228 Walker Hall (752-0360)

Faculty

Berni J. Alder, Ph.D., Profesor
Roger E. Anderson, Ph.D., Lecturer
Meera M. Blattner, Ph.D., Associate Professor
Stewart D. Bloom, Ph.D., Professor
Stewart Cameron, Ph.D., Assistant Professor
Ralph Carlson, Ph.D., Lecturer
Paul P. Craig, Ph.D., Professor
^{3,4}John S. De Groot, Ph.D., Professor
Michael Feit, Ph.D., Lecturer
John Feo, Ph.D., Lecturer
J. Patrick Fitch, Ph.D., Lecturer
John G. Fletcher, Ph.D., Lecturer
Roger A. Haas, Ph.D., Professor
Lawrence Hall, Ph.D., Lecturer
William G. Hoover, Ph.D., Professor
David Q. Hwang, Ph.D., Associate Professor
John Killeen, Ph.D., Professor
William L. Krueger, Ph.D., Lecturer
Nelson Max, Ph.D., Professor
Andrew McMahan, Ph.D., Lecturer
Arthur A. Mirin, Ph.D., Lecturer
William Morgan, Ph.D., Lecturer
William A. Newcomb, Ph.D., Professor
Richard F. Post, Ph.D., Professor in Residence
Harry B. Radousky, Ph.D., Lecturer
Garry Rodrigue, Ph.D., Professor
Bruce Shore, Ph.D., Lecturer
E. Eugene Schultz, Ph.D., Lecturer
Stephen K. Skedzielewski, Ph.D., Lecturer

duction to high level language programming techniques that are useful in all programming courses. Topics include programming 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.

106. Concurrent Programming (3) III. The Staff
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; Computer Science Engineering 100. 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 40. 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 Engineers and Scientists (3) I, II, III. The Staff (Wooten in charge)
Lecture—3 hours. Prerequisite: Engineering 5; Mathematics 22B. Introduction to error analysis, roots of equations, interpolation, quadrature, eigenproblems, systems of linear algebraic equations, ordinary differential equations, and deterministic and stochastic algorithms. Lectures and computational assignments on the application of digital computers to problems in engineering and science.

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. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Wooten in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

201A. Software Engineering (3) I, Blattner
Lecture—3 hours. Prerequisite: courses 101 and 106. Development of large production-quality programs, project management techniques, software design methodologies, computer security and the legal aspects of software development.

201B. Software Engineering (3) III. Blattner
Lecture—3 hours. Prerequisite: course 201A. Automated and integrated software tools for programming environments. Small-talk environment will be studied in depth. Tools implemented by object-oriented software will be examined.

202. Data Base Management (3) II. The Staff
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, Vemuri
Lecture—3 hours. Prerequisite: course 103 or the equivalent. Detailed design and organization of computer hardware and associated input and output devices. Topics include logic families, addressing methods, memory design, I/O devices, a survey of various architectural structures, and communication systems. A programming project will be performed.

203B. Computer Architecture (3) III. Vemuri
Lecture—3 hours; research paper and programming project. Prerequisite: course 203A. Topics in computer communication, hardware features to enhance operating systems, and advanced architectures.

205A. Mathematical Methods (3) I, Killeen
Lecture—3 hours. Prerequisite: introductory courses in or-

inary differential equations, vector analysis, infinite series, and functions of a complex variable. Calculus of finite and infinite dimensional vector spaces; orthonormal functions; linear equations. Applications of these analytical techniques to physical systems.

205B. Mathematical Methods (3) II. Killeen
Lecture—3 hours. Prerequisite: course 205A or the equivalent. Differential equations in the complex plane; contour integration; conformal mapping; Fourier and Laplace transforms; calculus of variations; applications of these techniques to physical systems.

205C. Mathematical Methods (3) III. Killeen
Lecture—3 hours. Prerequisite: course 205B or the equivalent. Eigenvalue problems; solution of linear differential and integral equations by expansions in orthonormal functions; Green's functions; approximation methods; applications to physical systems.

206. Programming Languages (3) III. The Staff
Lecture—3 hours; programming project. Prerequisite: course 106 or the equivalent. Examines topics in language design as the contour model and binding times, abstract data types, functional languages, and syntax analysis.

207. Compiler Construction (3) I. The Staff
Lecture—3 hours. Prerequisite: course 206. Syntax-directed translation techniques are used to implement a compiler for a block-structured, high-level programming language. Emphasis given to semantic analysis and code generation.

208A. Operating Systems I (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 108, 203B. Design of an operating system. Emphasis given to mechanisms commonly used to implement systems and the various policy options. Course stresses the Kernel design approach.

208B. Operating Systems II (3) II. The Staff
Lecture—3 hours. Prerequisite: course 208A. Concentration on operating system structure, interprocess communication, and issues of naming, error control, protection, synchronization, abstract object representation and encoding, resource management, and measurement in distributed operating systems. Course integrates design goals, problems, and mechanisms.

***208C. Operating Systems III** (3) III. The Staff
Lecture—3 hours. Prerequisite: course 208B. Synchronous and asynchronous models of interprocess communication; the abstract object model; distributed access control, error recovery, synchronization, naming; atomic actions; client/server model; implementation of a distributed kernel; example distributed applications.

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. 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.

211. Automata Theory and Formal Languages (3) I. The Staff
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. The Staff
Lecture—3 hours. Prerequisite: course 111. Investigation of time and space requirements of commonly used programming tasks, such as searching, sorting, set manipulation and graph algorithms. NP completeness and intractability also discussed.

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. The Staff
Lecture—3 hours. Prerequisite: courses 211 and 212. 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 symbolic manipulation languages. Offered in even-numbered years.

215A. Computational Mathematics (3) II. Rodrigue
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. Rodrigue
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. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Concepts of microprogramming, design and implementation of the internal logic and data to form the hardware primitives. Survey of the architecture of commercially available, user-microprogrammable computers. 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. Hoover
Lecture—3 hours. Prerequisite: course 205C. Facts and theories of crystal defect physics and their application to such problems as the mechanical properties of solids, radiation damage, phase transformations, etc. Covers thermodynamics of point defects, diffusion, elasticity dislocation theory.

230A-230B-230C. Structure of Matter (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 205C. Classical properties of matter; introduction of quantum mechanics by the correspondence principle; perturbation theory; electron theory of atoms, molecules and solids; quantum theory of cooperative effects.

233A-233B-233C. Theory and Applications of Solid-State Physics (3-3-3) I-II-III. 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. Newcomb
Lecture—3 hours. Prerequisite: Electrical and Computer Engineering 131B. Review basic electromagnetic field theory. Special relativity. Charges in fields. Radiation from charges: generation, scattering, diffraction. Electrodynamics of continuous media: conductors, dielectrics, superconductors, magnetic materials, plasmas. Transmission of electromagnetic waves through material. Modern applications of theory.

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) II. 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. The Staff
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. Laser Physics (3-3) I-II-Haas
Lecture—3 hours. Prerequisite: courses 230A-230B-230C, 234A-234B-234C. Theory of generation of laser radiation

and its interaction with matter. Dynamics of laser media, oscillators/amplifiers. Short pulse generation and propagation. Coherence properties of laser radiation. Fourier optics, resonators, and holography. Characteristics of laser devices. Laser spectroscopy.

266A-266B. Laser Physics Laboratory (3-3) I-II. Cameron Lecture—1 hour; laboratory—6 hours. Prerequisite: course 265A-265B (may be taken concurrently). Experiments exploring principles of generation and propagation of laser radiation. Laser measurement techniques. Dynamics of laser media. Oscillators and amplifiers. Generation of short pulses. Coherence properties of laser radiation. Holography. Characteristics of laser devices. Laser spectroscopy.

267. Nonlinear Optics (3) III. Haas

Lecture—3 hours. Prerequisite: course 265A-265B. Theory of the nonlinear interaction of radiation and matter. Nonlinear optical properties of materials. Crystal optics, electro-optics, and acousto-optics. Parametric oscillation and amplification. Harmonic conversion. Stimulated Raman and Brillouin scattering, self-focusing, four-wave mixing, phase conjugation and spectroscopy.

267L. Nonlinear Optics Laboratory (3) III. Cameron

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 265A-265B. Experiments exploring the principles of nonlinear optics. Phenomena studied selected from: crystal-optics, electro-optics, acousto-optics, parametric oscillation and amplification, harmonic conversion, stimulated Raman and Brillouin scattering, self-focusing, four-wave mixing, phase conjugation. Laser spectroscopy.

280A-280B-280C. Plasma Physics and Controlled Fusion (3-3-3) I-II-III. Hwang

Lecture—3 hours. Prerequisite: course 234B or consent of instructor. Equilibrium plasma properties; single particle motion; fluid equations; waves and instabilities in a fluid plasma; plasma kinetic theory and transport coefficients; linear and nonlinear Vlasov theory; fluctuations, correlations and radiation; inertial and magnetic confinement systems in controlled fusion.

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 (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Wooten in charge) (S/U grading only.)

Benjamin J. McCoy, Ph.D., Professor
Karen A. McDonald, Ph.D., Assistant Professor
Ahmet N. Palazoglu, Ph.D., Assistant Professor
Robert L. Powell, Ph.D., Associate Professor
Dewey D.Y. Ryu, Ph.D., Professor (*Chemical Engineering, Viticulture and Enology*)
J. M. Smith, Sc.D., Professor Emeritus
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 (Chairperson in charge)

Lecture—1 hour. Demonstrations and discussions of the opportunities in chemical engineering for professional development, contributions to basic knowledge, with clarification of what chemical engineers actually do in various jobs. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor and lower division standing. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

150A. Chemical Engineering Fluid Mechanics (4) II. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A, 22B, 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. Not open for credit to students who have completed Engineering 103A.

150B. Chemical Engineering Fluid Mechanics (4) III. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A. Turbulent flows and time averaging. Application of Bernoulli's equation and the macroscopic mass, momentum, and mechanical energy balances to a variety of practical problems. Introduction to compressible flow. The entropy equation and isentropic processes. Shock waves and choke flow. Not open for credit to students who have completed Engineering 103B or Civil Engineering 141.

151. Material Balances (3) I. The Staff (Chairperson 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 Lecture—3 hours. Prerequisite: course 151; Chemistry 110A. Application of principles of thermodynamics to chemical processes. Not open for credit to students who have completed Engineering 105A.

152B. Chemical Engineering Thermodynamics (4) III. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: course 152A. Continuation of course 152A. Not open for credit to students who have completed Engineering 105B.

153. Chemical Engineering Heat Transfer (4) III. The Staff Lecture—4 hours. Prerequisite: course 150A. Steady and transient heat conduction. The thermal energy equation, analysis of forced and free convective heat transfer. Turbulence, macroscopic balances, and heat transfer coefficients. The photon transport equation and radiant energy exchange. The design of heat exchangers.

154A. Mass Transfer (4) I. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: course 153, Chemistry 110A. Fundamental concepts of mass transfer in fluids. Problems in pure diffusion and convective mass transfer.

154B. Applications of Mass Transfer (3) II. The Staff Lecture—3 hours. Prerequisite: course 154A. Application of the principles of mass transfer and thermodynamic equilibrium to absorption, extraction, distillation and other separation processes.

155A. Chemical Engineering Laboratory (4) I, II. The Staff Laboratory—12 hours. Prerequisite: course 154A. Laboratory experiments in heat, mass, and momentum transfer and in chemical kinetics.

155B. Chemical Engineering Laboratory (4) II, III. The Staff Laboratory—12 hours. Prerequisite: courses 154B, 155A. Continuation of 155A.

156A. Chemical Engineering Kinetics (4) II. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: courses 152B, 154A; and Chemistry 110C (may be taken concurrently). Chemical kinetics and introduction to homogeneous and heterogeneous reactor design.

156B. Chemical Engineering Kinetics (4) III. The Staff Lecture—3 hours; discussion—1 hour. Prerequisite: course 156A. Continuation of course 156A.

157. Process Dynamics and Control (4) I, III. The Staff Lecture—3 hours; laboratory—3 hours. Prerequisite: course 159. 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 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 Lecture—3 hours. Prerequisite: Mathematics 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 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) III. McDonald Lecture—3 hours. Prerequisite: Chemistry 128A, Mathematics 22B, and Microbiology 2 or 102, or consent of instructor. Enzyme and microbial kinetics, bioreactor design and analysis, transport phenomena in bioreactors, and downstream processing.

163. Chemical Engineering in Integrated Circuit Fabrication Technology (4) I. The Staff Lecture—4 hours. Prerequisite: course 154A (concurrently); Chemistry 128B. Manufacture of semiconductor devices, integrated circuits, magnetic bubble memories, tapes and disks involving application of chemical engineering processing techniques. The chemistry and engineering of the industrial fabrication of modern circuits and devices.

190C. Research Group Conferences (1) I, II, III. The Staff Discussion—1 hour. Prerequisite: upper division standing in Chemical Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

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, Microbiology 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) 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 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 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.

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., Professor (*Chemical Engineering, Viticulture and Enology*)
Brian G. Higgins, Ph.D., Associate Professor
Alan P. Jackman, Ph.D., Professor
David F. Katz, Ph.D., Professor (*Chemical Engineering; Obstetrics and Gynecology*)

Macroscopic mass, momentum and mechanical energy balance.

253B. Advanced Heat Transport (3) II. The Staff
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
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.

254. Colloid and Surface Phenomena (4) III. Stroeve
Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 110C. 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. Applied Kinetics and Reactor Design (4) III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 253B, 253C. Application of kinetics and molecular transport rates to the design of chemical reactors with emphasis on heterogeneous systems.

259. Advanced Chemical Engineering Analysis (4) I. The Staff
Lecture—4 hours. Prerequisite: Mathematics 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 particulate systems in pollution abatement and chemical process equipment. Microorganisms, crystallization, aerosols, hydrosols, colloids. Distribution functions, polarization balances, rarefied gas phenomena, concentration polarization in reverse osmosis and filtration. Offered in odd-numbered years.

261. Separation Processes: Column Operations (3) III. McCoy
Lecture—3 hours. Prerequisite: course 154B. Analysis and design of chemical separation processes: distillation, extraction, chromatography, adsorption. Finite difference equations, unified design methods, axial dispersion models, probability and random walk theories, method of characteristics, moment analysis, optimization. Offered in even-numbered years.

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.

263. Rheology and Mechanics of Non-Newtonian Fluids (3) II. Powell
Lecture—3 hours. Prerequisite: courses 253A and 259 or consent of instructor. Mechanics of polymer solutions and suspension, especially the development of property invariant constitutive equations. Topics include: viscometry, linear and nonlinear viscoelasticity, continuum mechanics, kinetic theory. Offered in even-numbered years.

264. Introduction to Hydrodynamic Stability Theory (4) III. Higgins
Lecture—4 hours. Prerequisite: course 253A. Mathematical structure for studying the stability of fluid motions. Introduction to bifurcation theory and the spectral problem for linear stability. Offered in even-numbered years.

267. Advanced Process Control (3) II. McDonald, Palazoglu
Lecture—3 hours. Prerequisite: course 157 or the equivalent. Advanced course in analysis and synthesis of linear multivariable systems. Emphasis on frequency domain techniques and applications to chemical processes. Topics include singular value analysis, internal model control, robust controller design methods as well as self-tuning control techniques. Offered in even-numbered years.

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress and techniques in chemical engineering. May be repeated for credit. (S/U grading only.)

291. Seminar in Multiphase Transport Phenomena (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: graduate or senior standing.

Seminar devoted to the theoretical and practical applications of multiphase transport phenomena. Subjects will include flow in porous media, dispersion with 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 (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. Teaching of Chemical Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: qualifications and acceptance as teaching assistant and/or associate-in in chemical engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated twice for credit. (S/U grading only.)

Engineering: Civil

(College of Engineering)

Chih-Kang Shen, Ph.D., Chairperson of the
Department (752-1753)

Department Office, 206 Walker Hall (752-0586)

Faculty

Kandiah Arulanandan, Ph.D., Professor
Takashi Asano, Ph.D., Adjunct Professor
Don O. Brush, Ph.D., Professor
Robert H. Burg, M.S., Professor (*Civil Engineering; Land, Air and Water Resources*)

Daniel P. Y. Chang, Ph.D., Professor
James A. Cheney, Ph.D., Professor
Yannis F. Dafalias, Ph.D., Professor
Johannes J. DeVries, Ph.D., Adjunct Lecturer
Leonard R. Herrmann, Ph.D., Professor
James R. Hutchinson, Ph.D., Professor
(*Graduate Adviser*)

William K. Johnson, M.S., Lecturer
M. Levent Kavvas, Ph.D., Associate Professor
Ian King, Ph.D., Professor
Ryuichi Kitamura, Ph.D., Associate Professor
Ray B. Krone, Ph.D., Professor Emeritus
Bruce Kutter, Ph.D., Assistant Professor
Bruce E. Larock, Ph.D., Professor
Jay R. Lund, Ph.D., Assistant Professor
Miguel A. Mariño, Ph.D., Professor (*Civil Engineering; Land, Air and Water Resources*)

Kyran D. Mish, Ph.D., Assistant Professor
Gerald T. Orlow, Ph.D., Professor
Carlos E. Puente, Ph.D., Visiting Assistant
Professor (*Civil Engineering; Land, Air and Water Resources*)

Otto G. Raabe, Ph.D., Professor in Residence
(*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., Associate Professor
(*Civil Engineering; Environmental Studies*)
Michael A. Taylor, Ph.D., 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 measurement errors; line directions, traverse computations, horizontal and vertical curves; astronomical observations and calculations for latitude, longitude, azimuth, and time.

30. Engineering A Better Environment (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: intermediate algebra, and Physics 10 or Engineering 20. Introduction to fundamental concepts and methodologies of environmental engineering. Topics presented include water and air quality, environmental radiation and radioactivity, wastes management. Students will evaluate environmental issues in written essays and oral discussion. Intended for non-physical science majors. General Education credit: Nature and Environment/Non-Introductory.

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 and lower division standing. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

114. Probabilistic Systems Analysis for Civil Engineers (3) II. Kitamura

Lecture—3 hours. Prerequisite: Mathematics 21C. Probabilistic concepts and models in Civil Engineering. Statistical analysis of Civil Engineering experimental and field data. Introduction to stochastic processes models of Civil Engineering systems.

131A. Structural Analysis (3) I, III. Romstad
Lecture—3 hours. Prerequisite: Mathematics 22A; Engineering 104B (may be taken concurrently). Open to Engineering students only. Elastic structural analysis of determinate and indeterminate trusses, beams and frames. Calculation of displacements. Methods of virtual work, moment area, superposition, slope deflection, moment distribution.

131B. Matrix Structural Analysis and Introduction to Finite Element (3) I. Romstad
Lecture—2 hours; laboratory—3 hours. Prerequisite: Engineering 104B. Open to Engineering students only. Matrix formulation and computer analysis of statically indeterminate structures. Introduction to finite element methods for elasticity and bending problems.

132A. Structural Design: Metallic Elements (3) 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). Open to Engineering students only. Elastic and ultimate strength design procedures for columns and rectangular beams, T-beams and beams of general cross-section. Building code requirements for bending, shear, axial load, combined stresses and bond.

132C. Structural Design: Timber Elements (3) III. Ramey
Lecture—3 hours. Prerequisite: course 132A. Elements of timber structures and laminated structures, including connection design.

133. Properties of Concrete (4) I. Taylor
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 35; senior standing. Physical and chemical properties of cements, the properties of fresh concrete, the ingredients of concrete, the desirable characteristics of hardened concrete, and how to obtain them. Mix design methods.

134. Analysis and Design of Buildings (3) III. 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.

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. Open to Engineering students only. Nature of flow of a real fluid; flow in pipes; open channel flow; turbomachinery; fluid forces on objects: boundary layers, lift and drag.

141L. Engineering Hydraulics Laboratory (1) I, III, Larock
Laboratory—3 hours. Prerequisite: course 141 (may be taken concurrently). Open to Engineering students only. Laboratory experiments and demonstrations on flow measurement, sluice gates, hydraulic jump, flow characteristics, and centrifugal pumps.

142. Engineering Hydrology (3) I, II, Kavvas
Lecture—3 hours. Prerequisite: course 141 (may be taken concurrently), or the equivalent. Study of the hydrologic cycle. Frequency analysis of hydrologic variables. Precipitation analysis for hydrologic design. Evapo-transpiration, interception, depression storage and infiltration. Streamflow analysis. Flood routing through channels and reservoirs.

142L. Engineering Hydrology Laboratory (1) II, Kavvas
Laboratory—3 hours. Prerequisite: course 142 (may be taken concurrently). Laboratory calculations and demonstrations of hydrologic processes, such as rainfall-runoff, storm characteristics and precipitation, evaporation and transpiration, infiltration, streamflow, and flood routing.

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 resources, data, quality and uses; policies, legislation; institutions; laws; economics; environmental concerns; and public participation.

144. Groundwater Systems Design (3) I, Marino
Lecture—3 hours. Prerequisite: Engineering 5 and course 142 (may be taken concurrently); Applied Science Engineering 115 recommended. Groundwater occurrence, distribution, and movement; well-flow systems; design of wells; groundwater quality and contamination; aquifer management. Introduction to groundwater modeling.

145. Hydraulic Structure Design (3) III, DeVries
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 141, 141L, 142. Principles of project design. Methods of analysis and hydraulic design of storage systems, diversion structures, conveyance and regulation systems, and structures for irrigation, power, and flood control projects. Emphasis is on application of principles of open channel hydraulics in these systems.

146. Water Resources Simulation (3) II, Kavvas
Lecture—3 hours. Prerequisite: courses 142 and 144; course 145 recommended. Simulation techniques in the design of water resources projects; introduction to simulation theory and modeling; development and application of simulation models to surface water and ground water problems.

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. Open to Engineering students only. Introduction to basic concepts of water quality. Fundamentals of water and wastewater treatment processes. Analysis of treatment process flowsheets. Analysis of water quality management alternatives.

148B. Water Quality Management Systems Design (3) III, Tchobanoglous
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 148A (may be taken concurrently). Introduction to the design of water and wastewater treatment processes.

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. Basic planning concepts; role of engineering, economic, environmental and social information; institutional, political and legal aspects. Case studies will illustrate planning of water regulation and distribution systems, waste treatment and disposal systems, land and water transportation systems.

153. Deterministic Optimization (3) I, The Staff
Lecture—3 hours. Prerequisite: Mathematics 21C, 22A, and Engineering 5, or the equivalent. Introduction to operations research. Optimization techniques such as linear programming, dynamic programming, and 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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Geography 5.

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, The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: 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.

163. Energy and Environmental Aspects of Transportation (3) III, Sperling
Lecture—3 hours. Prerequisite: course 160. Application of engineering, economics and systems planning concepts to the relations between transportation and energy, and transportation and air quality, including technical, institutional, and policy considerations. Offered in even-numbered years. (Same course as Environmental Studies 163.)

171. Soil Mechanics (3) I, II, Anulanandan
Lecture—3 hours. Prerequisite: Engineering 104A (may be taken concurrently). Open to Engineering students only. 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: courses 10 and 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 affecting engineering structures. Discussion of geological aspects of engineering construction problems by means of case history studies. (Same course as Geology 175.)

177. Soil-Water Dynamics Laboratory (2) III, Cheney
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 171. Laboratory experiments in current research areas in soil dynamics. Topics to vary from year to year. Examples: excavation by explosives, impact penetration in soft soils,

simulated earthquakes in centrifuge models, seepage erosion in soil.

189A-J. Selected Topics in Civil Engineering (1-5) I, II, III, The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Directed group study of selected topics with separate sections in (A) Environmental Engineering; (B) Hydraulics and Hydrologic Engineering; (C) Engineering Planning; (D) Geotechnical Engineering; (E) Structural Engineering; (F) Structural Mechanics; (G) Transportation Engineering; (H) Transportation Planning; (I) Water Resources Engineering; (J) Water Resources Planning. May be repeated for credit when the topic is different.

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. (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. 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, asphalt, 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 Engineering 115 or Mathematics 128A-128B (128B may be taken concurrently), or consent of instructor. Approximate analysis procedures; Galerkin and stationary principle methods. Construction of approximate solutions by the finite element method. Applications to one- and two-dimensional problems in engineering. Introduction to time dependent, non-linear and 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. Class lectures and independent study.

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. Analytical and numerical methods for solution of plate equations.

222. Theory and Analysis of Shells (3) II. Brush, Herrmann
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) III. Orlow

Lecture—3 hours. Prerequisite: courses 141 and 142. Quality requirements for beneficial uses of water. Hydrologic cycle of quality. Hydromechanics in relation to quality of surface and ground-waters; transport and fate of waterborne pollutants. Predictive methods, introduction to water quality modeling.

241. Land Quality (3) I. The Staff

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, Orlow,
Lecture—2 hours; laboratory—3 hours. Prerequisite: one course from course 240, 241, or 242A (may be taken concurrently). Mathematical modeling of environmental quality, with emphasis on mathematical models of quality, 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 Systems Planning (3) I, Kitamura
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 160. Models of urban passenger transportation including trip generation, model split, trip distribution, and network assignment. Characteristics of travel demand using empirical data. Application of the models to estimate flows on urban highway and transit networks. Offered in even-numbered years.

254. Discrete Choice Analysis of Travel Demand (3) II, Kitamura
Lecture—3 hours. Prerequisite: Engineering 118 or the equivalent. Behavioral and statistical principles underlying the formulation and estimation of discrete choice models. Practical application of discrete choice models to characterization of choice behavior, hypothesis testing, and forecasting. Emphasis on computer exercises using large-scale data sets obtained from home interview surveys. Offered in odd-numbered years.

255. Urban Public Transportation (3) III, The Staff
Lecture—3 hours. Prerequisite: courses 153, 160, 161, and 162. Planning and operations design of urban transit systems. Role of public transport in urban settings, characteristics of urban transit systems, land use factors. Development of transit system plans, route and schedule design, facilities engineering. Offered in odd-numbered years.

256. Land Use and Transportation (3) I, The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 160. Impacts of transportation on urban development. Urban land use patterns and travel demand. Land use design and transportation system planning. Transport/land use interactions and their effects on the environment, energy consumption and economic development. Offered in even-numbered years.

257. Urban Traffic Management and Control (3) I, The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 161. Nature of urban vehicular traffic congestion. Management of roadway capacities. Intersection design and traffic signal operations. Surveillance, detection, forecasting, and management of traffic and traffic conditions in a network or a corridor. Offered in odd-numbered years.

258. Transportation Planning in Developing Countries (3) III, Sperling
Lecture—3 hours. Prerequisite: course 160 or consent of instructor. Investigation of the role that transportation investments and policies play in the development of regions and countries. Emphasis is on identifying appropriate technologies, policies and planning methods for designing transportation systems in regions of differing socioeconomic, geographic and institutional settings. Offered in even-numbered years.

260. Noncohesive Sediment Transportation (3) II, The Staff
Lecture—3 hours. Prerequisite: course 141. Sediment materials. Particle suspension by currents, waves, and winds. Modes of transport. Bed load relations and suspended load relations. Calculation of total loads in streams. Similarity criteria for movable bed models. Stable channel design. Offered in odd-numbered years.

261. Cohesive Particle Transportation (3) III, The Staff
Lecture—3 hours. Prerequisite: course 141. Cohesion; cohesive particulate materials; processes of aggregation and dispersion; aggregate properties; deposition and scour, channel and harbor design and maintenance. Offered in odd-numbered years.

266A. Applied Stochastic Methods in Engineering (3) I, Kavvas
Lecture—3 hours. Markov processes and their applications to modeling of engineering systems. Review of differential Smolukowski-Chapman-Kolmogorov equations, Brownian motion and Ornstein-Uhlenbeck processes within the framework of statistical diffusion theory and their engineering applications to pollution transport problems.

266B. Applied Stochastic Methods in Engineering (3) II, Kavvas

Lecture—3 hours. Stochastic differential equations and their applications to the solution of engineering problems.

267. Water Resources Management (3) I, Lund
Lecture—3 hours. Prerequisite: basic probability (Engineering 118 or the equivalent) and courses 141, 142; course 153 recommended. Operation, maintenance and modification of existing water resource systems; engineering, economic, financial, legal, and institutional considerations; decision, optimization, and multi-objective analysis.

268. Public Works Economics (3) II, Lund
Lecture—3 hours. Prerequisite: Engineering 106 or Agricultural Economics 148; Economics 1A recommended. Engineering economics applied to public works planning, operations, and maintenance problems; Microeconomic and macroeconomic theories; benefit-cost analysis; effect of uncertainty; optimization economics; non-classical economics; public finance.

269. Water Supply and Hydroelectric Power Planning (3) I, Johnson

Lecture—3 hours. Prerequisite: courses 142 and 152 or the equivalent. Analysis of drought phenomena and low stream-flow; water demand; risk and reliability analysis; conjunctive supply and conservation; planning alternatives. Capacity and energy determination; operations studies; planning alternatives; market requirements and load studies; analysis of system power and supply; regulatory considerations. Offered in odd-numbered years.

270. Advanced Water Resources Management (3) III, Lund
Lecture—3 hours. Prerequisite: courses 153 and 267 or the equivalent. Discussion of technical papers related to planning theory, system maintenance, regionalization, multi-objective methods, risk analysis, institutional issues, pricing, model application, economic development, forecasting, operations, and other topics.

271. Water Resources Planning Laboratory (3) II, Johnson
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 142, 152. Application of hydrology, hydraulics, systems analysis, economics and principles of plan formulation and plan evaluation in conducting a water resources planning study. Lectures provide instruction on principles and methodology used in the laboratory study.

272A. Advanced Groundwater Hydrology (3) II, King
Lecture—3 hours. Prerequisite: course 144 or the equivalent; Mathematics 118A recommended. Fundamental equations of groundwater flow. Flow in 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) III, King
Lecture—3 hours. Prerequisite: course 272A and 212A or the equivalent. Numerical methods of fluid flow systems. Flow in the unsaturated zone. Hydrodynamic dispersion. Fresh-water and salt-water interface in coastal aquifers. Identification of regional aquifer parameters. Modeling of aquifer systems. Offered in even-numbered years.

273. Water Resource Systems Engineering (3) I, Marifio
Lecture—3 hours. Prerequisite: course 153, Mathematics 131 or Statistics 131A. 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) II, Larock
Lecture—3 hours. Prerequisite: course 141; Engineering 5. Mechanics of liquid flow in pipes and pipe network systems. Steady flow, unsteady flow, surge and water-hammer problems. Manifold flow. Offered in even-numbered years.

275. Hydrologic Time-Series Analysis (3) III, Kavvas
Lecture—3 hours. Prerequisite: Engineering 118 and course 142 or the equivalent. Application of statistical methods for analysis and modeling of hydrologic series. Statistical simulation and prediction of hydrologic sequences using time series methodology. Offered in odd-numbered years.

276. Watershed Hydrology (4) II, Kavvas
Lecture—4 hours. Prerequisite: course 142 or the equivalent. Analysis and mathematical modeling of hydrologic processes taking place in a watershed. Precipitation analysis and modeling. Theory of overland flow and its kinematic wave approximation. Analysis and modeling of saturated and unsaturated subsurface flow processes taking place on a hill slope.

277. Unsteady Flow in Surface Waters (3) I, King
Lecture—3 hours. Prerequisite: course 141; Applied Science Engineering 115 may be taken concurrently. Long waves in surface flow. Shallow water equations. Saint Venant equations. Method of characteristics. Explicit and implicit finite element methods; stability of numerical schemes. Flood routing. Bores. Dam break.

278. Hydrodynamics (3) II, Larock
Lecture—3 hours. Prerequisite: course 141. Equations for conservation of mass, momentum, energy; vorticity, circulation; stream functions, velocity potential; flows by super-

position 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-I. Selected Topics in Civil Engineering (1-5) I, II, III. The Staff (Orlob in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Directed group study of special topics with separate sections in (A) Environmental Engineering; (B) Hydraulics and Hydrologic Engineering; (C) Engineering Planning; (D) Geotechnical Engineering; (E) Structural Engineering; (F) Structural Mechanics; (G) Transportation Engineering; (H) Transportation Planning; (I) Water Resources Engineering. May be repeated for credit.

290. Seminar (1) I, II, III. The Staff (Orlob in charge)
Seminar—1 hour. Discussion of current graduate research, and guest lectures on recent advances. Oral presentation of individual study. Course required of graduate degree candidates. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. Orlob in charge
Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress and techniques in civil engineering. May be repeated for credit for a maximum of 3 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. The Teaching of Civil Engineering (1) I, II, III. The Staff (Orlob in charge)
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Civil Engineering. Participation as teaching assistant or associate-in in designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for total of 9 units. (S/U grading only.)

Engineering: Electrical and Computer Science

(College of Engineering)

S. Louis Hakimi, Ph.D., Chairperson of the Department

Stephen T. Kowel, Ph.D., Vice Chairperson of the Department

Department Office, 3026 Bainer Hall (752-0583)

Faculty

V. Ralph Algazi, Ph.D., Professor
Robert W. Bower, Ph.D., Acting Professor
R. Branner, Ph.D., Associate Professor
Tsu-Shaun Chang, Ph.D., Assistant Professor
John N. Churchill, Ph.D., Professor
K. Wayne Current, Ph.D., Professor
Andrew J. Dienes, Ph.D., Professor
Richard C. Dorf, Ph.D., Professor
(*Electrical Engineering, and Computer Science Management*)
Kamilo Feher, Ph.D., Professor
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
S. Louis Hakimi, Ph.D., Professor
Stephen B. Haley, Ph.D., Professor
I. Horowitz, Ph.D., Professor
T.C. Steve Hsia, Ph.D., Professor
Charles E. Hunt, Ph.D., Assistant Professor
Paul J. Hurst, Ph.D., Assistant Professor
A. K. Jain, Ph.D., Professor
Andre Knoesen, Ph.D., Assistant Professor
Stephen T. Kowel, Ph.D., Professor
Bernard C. Levy, Ph.D., Professor
Wen C. Lin, Ph.D., Professor
John B. Powers, Ph.D., Professor Emeritus
G.R. Redinbo, Ph.D., Professor
Michael A. Soderstrand, Ph.D., Professor
Ronald F. Soohoo, Ph.D., Professor
Richard R. Spencer, Ph.D., Assistant Professor
Jerome J. Suran, Ph.D. (hon.), Senior Lecturer
(*Electrical Engineering, and Computer Science Management*)
Shih-Ho Wang, Ph.D., Professor

Division of Computer Science Engineering

Richard F. Walters, Ph.D., Chairperson of the Division
Division Office, 4455 Chemistry Annex (752-7004)

Faculty

Sergio Alvarado, M.S., Acting Assistant Professor
Myla M. Archer, A.M., Acting Assistant Professor
Gene L. Fisher, Ph.D., Assistant Professor
Daniel Gusfield, Ph.D., Associate Professor
Kenneth I. Joy, Ph.D., Associate Professor
Lawrence T. Kou, Ph.D., Professor
Karl Levitt, Ph.D., Professor
Peter Linz, Ph.D., Professor
Charles U. Martel, Ph.D., Associate Professor
Norman S. Matloff, Ph.D., Associate Professor
Biswanath Mukherjee, Ph.D., Assistant Professor
Ronald A. Olsson, Ph.D., Assistant Professor
Arvin Park, Ph.D., Assistant Professor
Manfred G. Ruschitzka, Ph.D., Professor
Richard F. Walters, Ph.D., Professor

Courses in Engineering: Electrical and Computer Science

(Courses in Electrical and Computer Science Engineering are listed below; courses in Computer

Science Engineering are listed immediately following.)

Lower Division Courses

1. Introduction to Electrical and Computer Engineering (1) III. The Staff (Chairperson in charge)
Lecture—1 hour. Electrical and computer engineering as a professional activity. What electrical engineers know and how they use their knowledge. Problems they are concerned with and how they go about solving them. Presentation of basic ideas and their applications. Examination of some case studies. (P/NP grading only.)

70. Computer Structure and Assembly Language (4) I, II, III. Lin
Lecture—3 hours; computer workshop—3 hours. Prerequisite: proficiency in at least one high-level programming language. Introduction to computer architecture; machine language; assembly language; macros and conditional macros; sub-routine/parameter passing; input/output programming, interrupt and trap; direct-memory access; absolute and relocatable code; re-entrant code; program development in an operating system.

89A-S. Special Topics in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science, (B) Programming Systems, (C) Digital Systems, (D) Communications, (E) Signal Transmission, (F) Digital Communication, (G) Control Systems, (H) Robotics, (I) Signal Processing, (J) Image Processing, (K) High-Frequency Phenomena and Devices, (L) Solid-State Devices and Physical Electronics, (M) Systems Theory, (N) Active and Passive Circuits, (O) Integrated Circuits, (P) Computer Software, (Q) Computer Engineering, (R) Microprocessing, (S) Electronics. May be repeated for credit when the topics is different.

92. Internship in Electrical and Computer Engineering (1-5) I, II, III. 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. (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

110A. Electronic Circuits (3) II. Spencer, Haley, Hurst
Lecture—3 hours. Prerequisite: course 112; Engineering 100; courses 111A, and 140 concurrently. Large and small signal and device models; analysis and design of bias and gain stages; analysis and design of op amps.

110B. Electronic Circuits (3) III. Spencer, Haley, Hurst
Lecture—3 hours. Prerequisite: courses 110A, 111A, 112, 140; course 111B concurrently. Analysis and design of multi-state and feedback amps; op-amp limitations and applications; active filters; oscillators; digital switches.

111A. Electronic Circuits Laboratory (1) II. Spencer, Haley, Hurst
Laboratory—3 hours. Prerequisite: Engineering 100, course 112; courses 110A, 140 concurrently. Design, analysis, and evaluation of transistor circuits, amplifiers, and op-amps.

111B. Electronic Circuits Laboratory (1) III. Spencer, Haley, Hurst
Laboratory—3 hours. Prerequisite: courses 110A, 111A, 112, 140; course 110B concurrently. Design, analysis and evaluation of multi-stage and feedback amps, oscillators and switching circuits.

112. Linear Systems and Circuits (4) I, Ford, Algazi, Chang
Lecture—4 hours. Prerequisite: Engineering 17; Mathematics 22A. Characterization and analysis of linear systems and circuits. Time domain analysis by convolution techniques. Emphasis on frequency domain techniques, including Laplace transform, Fourier transform and Fourier series, with applications to electrical circuits.

114A. Bipolar Integrated Circuit Applications (3) I, Churchill, Current, Hurst, Spencer
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110A-110B, 111A-111B. 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, Hurst
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 110A-110B, 111A-111B. 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 Fabrication (3) I, Hunt, Bower
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 140. Basic fabrication processes for Metal Oxide Semiconductor (MOS) integrated circuits. Laboratory Assignments covering oxidation, photolithography, impurity diffusion, metallization, wet chemical etching, and characterization work together in producing metal-gate PMOS test chips which will undergo parametric and functional testing.

115B. Advanced Integrated Circuits (3) II, Hunt, Bower
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 115A. Fabrication process for CMOS, VLSI. Laboratory projects examine deposition of thin films, ion implantation, process simulation, anisotropic plasma etching, sputter metallization, and C-V analysis. Topics include isolation, projection alignment, epilayer growth, thin gate oxidation, and rapid thermal annealing.

130A. Introductory Electromagnetics (3) I, Dienes, Fink, Knoesen
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. Introduction to analysis and design of microwave transistor and tunnel diode amplifiers.

134. Radar Systems and Signals (3) III, 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.

139. Fields and Waves for Computer Majors (4) I, Dienes, Fink
Lecture—4 hours. Prerequisite: Mathematics 22B, 22C, Physics 8B. Static electric and magnetic fields. Electromagnetic waves and transmission lines.

140. Fundamental Principles of Device Physics (4) II, Churchill, Haley
Lecture—4 hours. Prerequisite: course 130A or 139; Physics 8B. Semiconductor device fundamentals: equilibrium and non-equilibrium statistical mechanics, conductivity, diffusion, density of states, electrons and holes, p-n junctions, MOS capacitors, bipolar junction transistors and field effect transistors.

145A. Solid-State Electronics (3) III, Kowel
Lecture—3 hours. Prerequisite: Physics 8D. Quantum mechanics, including the Schrodinger equation, and matrix formulation. One-dimensional problems including tunneling, bound states, simple harmonic oscillator. Angular momentum, hydrogen atom. Electrons in a periodic lattice, energy bands. Perturbation theory. Fermi-Dirac statistics.

145B. Solid-State Electronics (3) I, Churchill, Soohoo, Haley, Hunt
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) III, Fink
Lecture—3 hours. Prerequisite: course 130B or course 140 or the equivalent. Fundamental properties of superconductors of the first and second kind, London and Ginzburg-Landau theories, Josephson effects, applications and devices.

150. Microprocessor-Based Instrumentation Systems (4) III, Soderstrand
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 70 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 response, signal conditioning, A/D conversion, data transmission, hardware interfacing, software development, noise and safety.

151. Discrete Time Systems (3) I, Hsia, Ford, Wang
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.

152. Feedback Design of Uncertain Systems (3) I, Horowitz
Lecture—3 hours. Prerequisite: course 112. Quantitative design of feedback systems to achieve prescribed performance tolerances despite large uncertainties in system parameters and competing disturbance inputs. Application to single input-output, linear time invariant, time varying and nonlinear systems. Minimization of the cost of feedback.

157A. Control Systems (3) II, Hsia, Dorf, Wang, Chang
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, Feher
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, Feher, 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.

166. Digital Communications: Satellite, Microwave, Cable (3) III, Feher
Lecture—3 hours. Prerequisite: courses 160 and 165. Introduction to digital communications by satellite, microwave and cable systems. Baseband signal processing techniques for digital MODEMS in TOMA and SCPC satellite and terrestrial microwave systems.

171. Introduction to Computer Architecture (4) I, II, III, Lin
Lecture—3 hours; discussion—1 hour. Prerequisite: course 70. Study of the interrelationship and interaction of various parts of computer systems including instruction sets, processing and control units, particularly microprogrammed control units, buses, input-output, arithmetic and logic processing, and memory system hierarchies.

172. Microcomputer-Based System Design (4) I, II, Lin
Lecture—2 hours; laboratory—6 hours. Prerequisite: courses 70, 176; course 177 (concurrently) recommended. 8080/8085 microprocessor architecture; bus-based system architecture; peripheral chips architecture; I/O interface design; interrupt driven system design; general system design procedure, CP/M operation system; comparison of different types of microprocessors.

175. Computer Devices and Systems (3) III, Soohoo
Lecture—3 hours. Prerequisite: course 140. Characteristics and design of the essential components of a computer. Design of I/O, storage, memory, logic, and control units using devices with realistic rather than idealized characteristics emphasized. Advantages and disadvantages of alternative realizations are considered.

176. Digital Systems I (4) II, III, Lin
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 100. Introduction to digital system design including combinational logic design, sequential and asynchronous circuits, computer arithmetic, memory systems and algorithmic state machine design.

177. Digital Systems II (4) I, III, Lin
Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 110A-110B, 176. Introduction to design multi-input/output sequential digital systems; timing/pulse circuits; TTL, CMOS, ECL and other logic elements; analog switch; sample/hold; analog-digital-analog converters design; system noise problems: grounding, shielding, transmission line, cross-talk; memory system design.

182A. Operating System Design (4) I, Ruschitzka
Programming workshop—3 hours. Prerequisite: course 171 and Computer Science Engineering 142. 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.

189A-S. Special Topics in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science; (B) Programming Systems; (C) Digital Systems; (D) Communications; (E) Signal Transmission; (F) Digital Communication; (G) Control Systems; (H) Robotics; (I) Signal Processing; (J) Image Processing; (K) High-Frequency Phenomena and Devices; (L) Solid-State Devices and Physical Electronics; (M) Systems Theory; (N) Active and Passive Circuits; (O) Integrated Circuits; (P) Computer Software; (Q) Computer Engineering; (R) Microprocessing; (S) Electronics. May be repeated for credit when topic is different.

190C. Research Group Conferences in Electrical and Computer Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper division standing in Electrical and Computer Science Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

192. Internship in Electrical and Computer Engineering (1-5) I, II, III. The Staff (Chairperson in charge)
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. (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

204. Digital Processing of Signals (4) II, Algezi, 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) II, 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.

- 210. Analog Circuit Design** (3) I. Spencer, Current, Hurst
Lecture—3 hours. Prerequisite: courses 110A-110B, 111A-111B. Analysis and design of amplifiers, bias circuits, voltage references and other analog circuits. Feedback and compensation of linear amplifiers. Computer-aided analysis is used extensively.
- 211. Advanced Analog Circuit Design** (3) II. Spencer, Current, Hurst
Lecture—3 hours. Prerequisite: course 210; Statistics 131A or the equivalent recommended. Noise in electronic circuits and systems. Distortion analysis; the translinear principle and its application to circuit analysis and synthesis; phase-locked loops and their applications.
- 212. Analog MOS IC Design** (3) III. Hurst, Spencer, Current
Lecture—3 hours. Prerequisite: course 210A or 114A and consent of instructor. Analysis and design of analog MOS integrated circuits. CMOS process, MOS device modeling, passive components, single stage amplifiers, current sources, op amps, compensation, comparators, switched-capacitor filters, and analog-to-digital converters.
- 214A. Computer-Aided Circuit Analysis and Design** (3) I. Haley, Current
Lecture—3 hours; computer project. Prerequisite: courses 110A-110B, 111A-111B; knowledge of Fortran or C. Network equation formulations; nonlinear dc and linear ac circuit analysis. Calculation of dc and ac network sensitivities. Extensive computer project.
- 214B. Computer-Aided Circuit Analysis and Design** (3) II. Current, Haley
Lecture—3 hours; computer project. Prerequisite: course 214A. Transient (time-domain) analysis; harmonic analysis; steady-state analysis; time-domain network sensitivities, ac, dc, transient gradient calculations, design optimization. Extensive computer project.
- 215. Advanced Projects in IC Fabrication** (3) III. Churchill, Current, Hunt, Spencer
Discussion—1 hour; laboratory—6 hours. Prerequisite: course 115B. Individualized projects in the fabrication of analog or digital integrated circuits.
- 218A. Introduction to VLSI Circuits** (3) I, Current, Hurst, Spencer
Lecture—3 hours. Prerequisite: courses 110A-111A, 110B-111B. Theory and practice of VLSI circuit and system design. Extensive use of VLSI computer-aided design aids allows students to undertake a VLSI design example.
- 218B. Multiproject Chip Design** (1) II. Current, Hurst, Spencer
Laboratory—3 hours. Prerequisite: course 218A. CMOS and NMOS multiproject chip layouts of projects begun in courses 218A, 212, and 219 are assembled and submitted to the DARPA/NSF MOSIS Program for fabrication.
- 218C. IC Testing and Evaluation** (1) III. Current, Hurst, Spencer
Laboratory—3 hours. Prerequisite: course 218B. Chips submitted in course 218B are tested and evaluated. Issues involving design of ICs for testability are discussed.
- 219. Advanced Digital Circuit Design** (3) III. Hurst, Current, Spencer
Lecture—3 hours. Prerequisite: course 114B or 218A. Analysis and design of digital circuits. Both bipolar and MOS circuits. Dynamic and static RAM cells and sense amplifiers. Advanced MOS families. Multivalued logic.
- 221. Passive Filter Design** (3) I, Soderstrand, Current, Haley
Lecture—3 hours. Prerequisite: Engineering 100 and course 112 or the equivalent. Introduction to the design of passive filters with lumped and distributed elements. Filter specification and design process, approximation theory, modern doubly terminated reactance, two-port synthesis, passive filters with lumped elements, crystal and ceramic filters, mechanical filters.
- 222. Active Filter Design** (3) II. Soderstrand, Current, Haley
Lecture—3 hours. Prerequisite: course 221 recommended. Introduction to the design of active filters with lumped elements and switches. Active filters with lumped RC elements, active-R networks, and switched capacitor filters.
- 225. RF Amplifiers, Oscillators, Mixers and Antennas** (4) III. Branner
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 132B and consent of instructor. Microwave amplifier theory and design including transistor circuit models, stability considerations, noise models and low noise design. Theory and design of microwave transistor oscillators and mixers. Analysis and design of linear, loop, waveguide and horn radiators.
- *226A. Quantum Electronics** (3) II. 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) III. Dienes, Fink
Lecture—3 hours. Prerequisite: course 226A. Lasers, masers: population inversion, threshold requirement, steady-state and transient behavior, Q-switching. Interaction between radiation and phonons. Offered in odd-numbered years.
- *227A. Microwave Electronics** (3) I, Soohoo
Lecture—3 hours. Prerequisite: courses 130B and 140 or the equivalent. Theory of microwaves, waveguides and cavities. Interaction between electromagnetic fields and the electron charge. Lorentz force law, energy levels in matter and Zeeman splitting. Comparison between conventional and microwave tubes and other new types of microwave oscillators and amplifiers. Offered in odd-numbered years.
- *227B. Microwave Electronics** (3) II. Soohoo
Lecture—3 hours. Prerequisite: course 227A or the equivalent. Theory of interaction between electromagnetic fields and electronic charge, with applications to electron beam and solid-state devices. Beam formation, velocity and density modulation, plasma oscillation, space charge wave propagation in klystrons. Parametric amplifiers, tunnel and IMPATT diodes, Gunn oscillators. Offered in even-numbered years.
- 228. Advanced Microwave and Antenna Design Techniques** (3) III. Branner
Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 132B or 131B, 221. Design, fabrication, analysis of advanced microwave devices, antennas. Includes FET amplifiers, broadband microstrip and stripline filters, hybrids, beam-formers, tapered networks. Youla's broadband matching theory applied to microwave devices. Antenna design, analysis of horns, microstrip, log periodic radiators, arrays, spirals and reflectors.
- 230. Electromagnetic Waves** (3) I, Fink, Dienes
Lecture—3 hours. Prerequisite: course 130B. Plane waves, boundary value problems, wave-guides of various cross sections. Dielectric guides, fiber optics. Dispersion of signals.
- 231. Electromagnetic Theory** (3) II. Dienes, Fink
Lecture—3 hours. Prerequisite: course 131B. Advanced topics in electromagnetics, including propagation in anisotropic and nonlinear media.
- 232. Advanced Applied Electromagnetics** (3) II. Branner
Lecture—3 hours. Prerequisite: course 131B or 132B. Exact formulation of applied electromagnetic problems by using Green's functions. Applications of these techniques to transmission circuits.
- 240. Quantum Mechanics** (3) I, Kowal
Lecture—3 hours. Quantum dynamics of particles and waves. Schrodinger's equation, tunneling, angular momentum, atomic structure and bonding, perturbations, one-dimensional band-theory of solids, interaction of matter with radiation, photons.
- 245A. Applied Solid-State Physics** (3) II. Fink, Soohoo, Churchill, Kowal, Haley
Lecture—3 hours. Prerequisite: course 145C or the equivalent. Physics of solids relevant to solid-state applications. Topics include conduction mechanisms in semiconductors and transport phenomena in semi-conductors, and polarization and magnetism in solids.
- 245B. Applied Solid-State Physics** (3) III. Fink, Churchill, Soohoo, Haley, Kowal
Lecture—3 hours. Prerequisite: course 245A or the equivalent. Theory of semiconductors with application to transistors. Topics include transport and recombination of excess carriers and semiconductor devices.
- 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.
- 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-insulator-semiconductor diodes, insulated gate field effect transistors, thin film devices, optoelectronic devices, and charge-coupled devices.
- 250. Linear Systems and Signals** (4) I, Hsia, Wang, Chang
Lecture—4 hours. Prerequisite: course 112. Review of linear algebra. Mathematical description of systems. Solution of the state equations and an analysis of controllability, observability, realizations, state feedback and state estimation. Introduction to discrete-time signals and system, and the Z-transform.
- *251. Nonlinear Control Systems** (3) II. Horowitz
Lecture—3 hours. Prerequisite: course 152. Feedback systems with uncertain nonlinear plants; techniques for achieving performance tolerances; single input-single output (SISO) and multiple input-multiple output (MIMO); cost of feedback; dithered adaptive systems.
- 253. Adaptive Systems** (3) I, Hsia
Lecture—3 hours. Prerequisite: courses 151, 250 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, 250 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.
- 255. Robotic Systems** (3) I, Hsia, Wang
Lecture—3 hours. Prerequisite: courses 112 and 157A. Introduction to robotic systems. Mechanical manipulators, kinematics, manipulator positioning and path planning. Dynamics of manipulators and optimal control. Computer vision and visual feedback, robot motion programming, and control algorithm design.
- 258. Optimization Techniques with Applications** (3) II. Wang, Hsia
Lecture—3 hours. Prerequisite: knowledge of FORTRAN or C and graduate status. Computer-aided optimization of single-variable and multi-variable functions with and without constraints. Sequential search methods. Gradient methods. Linear and nonlinear programming. Typical applications in different disciplines.
- 259. Optimization of Dynamic Systems** (3) III. Hsia, Chang
Lecture—3 hours. Prerequisite: course 250. Introduction to dynamic system optimization techniques with applications. Calculus of variations, maximum principle, dynamic programming. Applications to various optimization problems in system engineering.
- *260. Random Signals and Noise** (4) II. Gardner
Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 131A. Random processes as probabilistic models for signals and noise. Review of probability, random variables, and expectation. Study of correlation function and spectral density, ergodicity and duality between time averages and expected values, filters and dynamical systems. Applications.
- 262. Spectral Analysis** (4) 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, leakage, and reliability. Analog and digital methods. Parametric modeling and nonparametric methods. Cross-spectral analysis. Applications to detection and estimation.
- 264. Estimation of Detection of Signals in Noise** (4) III. Gardner
Lecture—3 hours; discussion—1 hour. Prerequisite: course 263. Introduction to theory of estimation and detection of signals in noise. Mean-square estimation including recursive least squares and Wiener and Kalman filtering; maximum-likelihood parameter estimation. Bayes and Neyman-Pearson likelihood-ratio tests for signal detection. Applications to communications, radar, signal processing.
- 266. Information Theory and Coding** (3) I, Algazi
Lecture—3 hours. Prerequisite: Statistics 131A. Information theory and coding. Measure of information. Redundancy reduction encoding of an information source. Capacity of a communication channel, error-free communications. Linear block and convolutional codes.
- 267. Digital Communications Engineering** (3) I, Feher
Lecture—3 hours. Prerequisite: course 263. Concepts and system configurations. Principles and design of data transmission systems. Optimum transmitters/receivers for digital baseband and modulation systems. Design and application of QPSK, QAM, QPRS and of error correction codes in ISDN satellite, microwave and cable systems.
- 268. Advanced Digital Modulation Techniques** (3) II. Feher
Lecture—3 hours. Prerequisite: courses 263 and 267. MODEM (modulator-demodulator) and signal-processing subsystem analysis, design and application for digital satellite, microwave, mobile radio and cable systems. Study of correlative/coded modems, computer-aided and hardware design of advanced communications and synchronization systems.
- 269. Introduction to Optical Imaging and Information Processing** (3) II. Kowal
Lecture—3 hours. Prerequisite: course 131A or the equivalent. Review of the scalar theory of diffraction and of two-dimensional Fourier transforms, from which the foundations of the frequency analysis of imaging systems will be developed. Image processing techniques will be examined, including the theory and applications of holography.
- 270. Computer Architecture** (3) II. Matloff
Lecture—3 hours. Prerequisite: course 171 and Statistics 131A. Emphasis on quantitative analysis of design tradeoffs, optimization of resource usage, formal descriptive models, and interactions between architecture and software.

271. Advanced Digital System Design (4) III. 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 (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 171 and Computer Science Engineering 100. 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.

273. Bit-Slice Microprocessor Systems (3) III. Lin
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 172 and 177. Literature search and comparison of the most popular bit-slice microprocessors. Microprogramming technique for the design of control unit of CPU; microprogram control technique and state machine concept for digital logic design; hardware emulation of microprocessor/microcomputer.

274. Parallel Computer Architectures (3) III. Matloff
Lecture—3 hours. Prerequisite: course 277. Use of parallelism to achieve high performance levels. Within-CPU parallelism, through pipelining. Multiple-CPU parallelism, through array processors and multiprocessors, and through novel structures such as dataflow machines. Current research.

275. The Design and Analysis of Digital Sequential Machines (3) III. Redinbo
Lecture—3 hours. Prerequisite: Computer Science Engineering 100. Study of finite-state sequential machine design, models and behavior; minimal and equivalent realizations; incompletely specified machines; serial and parallel decompositions; partition algebras; loop free structures; regular expressions; linear sequential systems; controllability and observability; Turing machines; semigroups and machines.

***276A. Introduction to Fault-Tolerant Computing** (3) II. Redinbo
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. Redinbo
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.

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.

289A-S. 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. (P) Computer Software; (Q) Computer Engineering; (R) Microprocessing; (S) 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. Graduate Research Group Conference in Electrical and Computer Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: consent of instructor. Research problems, progress and techniques in electrical and computer engineering. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. The Teaching of Electrical Engineering (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Electrical Engineering. Participation as a teaching assistant or associate-

in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

Courses in Engineering: Computer Science

Lower Division Courses

10. Basic Concepts of Computing (3) I, II, III. The Staff
Lecture—2 hours; discussion—1 hour. Prerequisite: two years of high school algebra. Introduction to principles of computing. Methods and algorithms for solving problems by use of a digital computer. Not intended for students in physical sciences, engineering, or mathematics. (Not open for credit to students who have completed course 30, 30H, Engineering 5, or former course 8, 20, or Mathematics 29A.)

30. Introduction to Programming and Problem Solving (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A or 21A (may be taken concurrently). Introduction to 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. (Not open for credit to those who have completed Engineering 5 or Computer Science Engineering 30H, and only 2 units of credit allowed those who have completed course 10, former course 20 or Mathematics 19. Those who have completed Engineering 5 or the equivalent, and transfer into an Electrical Engineering or Computer Science and Engineering major should take the Engineering 5-Computer Science Engineering 32 sequence as opposed to the Computer Science Engineering 30-40 or 30H-40H sequence.)

30H. Honors Structure and Interpretation of Computer Programs I (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Major in Computer Science and Engineering or Electrical Engineering; Mathematics 16A or 21A (may be taken concurrently). More intensive treatment of material in course 30-40. Mathematics SAT score 680 or above suggested. Mathematical foundations of computer science. Procedural abstraction, data abstraction, and modularity. The Scheme programming language is used. Design and analysis of algorithms are stressed. (Not open for credit to those who have completed Engineering 5 or Engineering Computer Science 30, and only 2 units of credit allowed those who have completed course 10 or former course 20. Students who have completed Engineering 5 or the equivalent, and are transferring to a major in Electrical Engineering or Computer Science and Engineering should take Engineering 5-Computer Science Engineering 32 sequence as opposed to Engineering Computer Science 30-40 or 30H-40H sequence.)

32. Pascal Programming and Software Development (4) I, The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 16A or 21A (may be taken concurrently); Engineering 5 or the equivalent, or consent of instructor. Intended for graduate and transfer students. Fast-paced course teaching Pascal programming language as well as software development techniques and programming design and implementation techniques. (Not open to those who have received credit for Computer Science Engineering 30, 30H, 40, 40H; those who take Engineering 5 or the equivalent, and transfer into an Electrical Engineering or Computer Science and Engineering major should take the Engineering 5-Computer Science Engineering 32 sequence as opposed to the Computer Science Engineering 30-40 or 30H-40H sequence.)

40. Introduction to Software Development (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 30. Elements of program design; programming style, documentation, efficiency, debugging, verification; advanced features of Pascal and introduction to FORTRAN; introduction to dynamic data structures. (Not open to those who have received credit for Engineering Computer Science 32, or 40H. Those who take Engineering 5 or the equivalent and then transfer into an Engineering Electrical or Computer Science and Engineering major should take the Engineering 5-Computer Science Engineering 32 sequence as opposed to the Computer Science Engineering 30-40 or 30H-40H sequence.)

40H. Honors Structure and Interpretation of Computer Programs II (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 30H. More intensive treatment of material in course 40. Continuation of 30H. Comparison of Pascal-like languages and LISP-like languages. Defining recursive data structures such as linked lists and trees. Advanced abstraction and problem solving techniques. Programming languages Scheme and Pascal are used. (Not open for credit to those who have completed Engineering 5 or Engineering Computer Science 40. Students who have completed Engineering 5

or the equivalent, and are transferring to a major in Electrical Engineering or Computer Science and Engineering should take Engineering 5-Computer Science Engineering 32 sequence as opposed to Computer Science Engineering 30-40 or 30H-40H sequence.)

89A-K. Special Topics in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks; (J) Computer-Aided Design; (K) Scientific Computing. May be repeated for credit when the topic is different.

92. Internship in Computer Science (1-5) I, II, III. The Staff
Work-learn experience. Prerequisite: lower division standing; project approval prior to period of internship. Supervised work-learn experience in computer science. May be repeated for credit. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. Discrete Structures (3) I, II, III. Archer, Kou
Lecture—3 hours. Prerequisite: Mathematics 21C. Discrete structures and applications to various areas of computer science; mathematical models and mathematical reasoning, sets, relations, functions, methods of counting. (No credit allowed to those who have had former Electrical and Computer Science Engineering 191.)

110. Data Structures and Programming (4) I, II, III. Martel
Lecture—3 hours; discussion—1 hour. Prerequisite: course 40 or 40H or consent of instructor; Electrical and Computer Science Engineering 70 or former Electrical and Computer Science Engineering 170. Concept of data-type, arrays, records, set structures and their representation. Sequential file structures. Dynamic information structures, linear lists, tree structures. Hash techniques, recursive algorithms, sorting and searching. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 180 or Mathematics 129A.)

120. Automata Theory and Formal Languages (3) I, II. Archer, Linz
Lecture—3 hours. Prerequisite: course 100. Finite automata and regular expressions, deterministic and nondeterministic automata, finite-state transducers. Regular sets, pumping lemma, closure properties, minimization. Context-free grammars, derivations, normal forms, ambiguity. Pushdown automata, pumping lemma and their relation to context-free languages. (Not open for credit to students who have completed former course 126 or Mathematics 171.)

122. Algorithm Design and Analysis (3) II, III. Gusfield, Martel
Lecture—3 hours. Prerequisite: courses 100, 110. Complexity of algorithms, bounds on complexity, algorithms for searching, sorting, pattern matching, graph manipulation, combinatorial problems, introduction to NP-complete problems. (Not open for credit to students who have completed former course 123 or Mathematics 129B.)

140. Programming Languages (4) I, II, III. Archer, Fisher
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Syntactic definition of programming languages. Introduction to programming language features including variables, data types, data abstraction, scoping, parameter disciplines, exception handling. Comparative study of several high-level languages. (Not open for credit to students who have completed former course 124 or Mathematics 129C.)

142. Compilers (4) III. Archer, Fisher
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 120 and 140; course 160 recommended. Principles and techniques of lexical analysis, parsing, semantic analysis, and code generation. Implementation of compilers. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 181.)

150. Operating Systems and System Programming (4) II, III. Levitt, Matloff
Lecture—3 hours; discussion—1 hour. Prerequisite: Electrical and Computer Science Engineering 70; Electrical and Computer Science Engineering 171 strongly recommended. Basic concepts of operating systems and system programming. Processes and interprocess communication/synchronization; virtual memory, program loading and linking; file and I/O subsystems; utility programs.

152. Introduction to Computer Networks (3) I, Matloff
Lecture—3 hours. Prerequisite: Electrical and Computer Science Engineering 171. Overview of uses of local and wide-area computer networks. ISO seven-layer model. Physical aspects of data transmission. Data link level protocols. Local area networks. Wide area networks.

160. Introduction to Software Engineering (4) III. Fisher, Levitt
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 110 and 140. Requirements, specification, design, implementation, testing, and verification of large software systems. Study and use of software engineering methodologies. Team programming. (Not open for credit to students who have completed former course 129 or Mathematics 176.)

165. Database Systems (4) II, III. Walters
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110. Database hardware; input techniques; file types; database models; reliability, integrity and security; operating system interfaces with databases.

***168. Information Systems** (3) I, Walters
Lecture—3 hours. Prerequisite: course 40 or the equivalent; upper division standing. Design, creation, implementation, and case study evaluation of information systems. Project-oriented, self-paced implementation of actual information including survey collection of data, input design, and development of components to edit, sort, and retrieve data. Case study of typical information systems problems. Offered in even-numbered years.

170. Introduction to Artificial Intelligence (4) II. Levitt
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110; course 140 or experience with LISP recommended. Design and implementation of intelligent computer systems. LISP as a programming language for building symbolic processing systems. Knowledge representation and organization. Memory and inference. Problem solving. Natural language processing. (Not open for credit to students who have completed former course 128 or Mathematics 174.)

175. Computer Graphics (4) I, II. Joy
Lecture—3 hours; discussion—1 hour. Prerequisite: course 110, Mathematics 22A. Principles of computer graphics. Current graphics hardware, elementary operations in two- and three-dimensional space, transformational geometry, clipping, graphics system design, standard graphics systems. Individual projects. (Not open for credit to students who have completed former course 127 or Mathematics 173.)

189A-K. Special Topics in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks, (J) Computer-Aided Design; (K) Scientific Computing. May be repeated for credit when the topic is different.

190C. Research Group Conferences in Computer Science (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper-division standing in Computer Science Engineering; consent of instructor. Research group conferences. May be repeated for credit. (P/NP grading only.)

192. Internship in Computer Science (1-5) I, II, III. The Staff (Chairperson in charge)
Work-learn experience. Prerequisite: completion of a minimum of 84 units; project approval prior to period of internship. Supervised work-study experience in computer science. Max 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 Course

214A. Computer-Aided Circuit Analysis and Design (3) I, Haley, Current
Lecture—3 hours; project. Prerequisite: courses 110A-110B, 111A-111B, and knowledge of FORTRAN or C. Network equation formulations, nonlinear dc and linear ac circuit analysis. Calculations of dc and ac network sensitivities. Extensive computer project.

220. Theory of Computation (3) II. Archer, Kou
Lecture—3 hours. Prerequisite: courses 120 and 122. Theory of computation: the notion of effective procedures, computability, Turing machines, Post symbol manipulation system, models similar to digital computers, computational complexity and intractable problems. (Not open for credit to students who have completed the same topic under Electrical and Computer Science Engineering 289.)

***221. Formal Language Theory** (3) III. Archer, Linz
Lecture—3 hours. Prerequisite: course 220. Definition and properties of formal languages, deterministic context-free languages, context-sensitive languages, abstract families of languages, special topics of current interest.

222A. Design and Analysis of Algorithms (3) I. Gusfield, Martel
Lecture—3 hours. Prerequisite: course 122; Statistics 131A recommended. Techniques for designing efficient algorithms

and analyzing their complexity. Use of data structures. Counting and estimating. Search techniques. Graph algorithms. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 277A.)

222B. Advanced Design and Analysis of Algorithms. (3) II. Martel
Lecture—3 hours. Prerequisite: course 222A. Advanced topics in complexity theory. Problem classification. The classes P, NP, P-space, co-NP. Matching and network flow algorithms. Matrix multiplication. Approximation algorithms. Selected advanced topics. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 277B.)

223. Parallel Algorithms (3) I. Martel
Lecture—3 hours. Prerequisite: course 222A. Models of parallel computer systems including PRAMs, loosely coupled systems and interconnection networks. Parallel algorithms for classical problems are studied as well as general techniques for their design and analysis. Lower bounds on parallel computation are proved in several settings.

225. Graph Theory (3) III. Hakimi
Lecture—3 hours. Prerequisite: graduate standing in electrical engineering or computer science engineering or consent of instructor. Fundamental concepts, Vector space and graphs. Planar graphs: Whitney's and Kuratowski's theorems. Topological parameters: packings and coverings. Connectivity: Menger's theorem. Hamilton graphs: Posa's and Chvatal's theorems. Graph factorization: Tutte's theorem. Graph coloring: Brooks; and Vizing's theorem.

226. Computational Algorithms in VLSI (3) I. Kou
Lecture—3 hours. Prerequisite: course 122; Electrical and Computer Science Engineering 176. Application and inherent limitations of using VLSI to implement computational algorithms; design and analysis of algorithms for the design of VLSI circuits; VLSI test set generation and simulation.

240. Programming Languages (3) II. Archer, Fisher
Lecture—3 hours. Prerequisite: courses 140, 142. Advanced topics in programming languages including formal syntax and semantics, formal verification, modularization, data flow languages, object-oriented languages, concurrent processing. Principles of programming language design.

242. Translation of Programming Languages (3) III. Archer, Fisher
Lecture—3 hours. Prerequisite: course 240. Lexical analysis, parsing, storage management, symbol table design, semantic analysis and code generation. LR, LALR grammars. Compiler-compilers. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 278B.)

***243. Code Generation and Optimization** (3) I, Fisher
Lecture—3 hours. Prerequisite: course 242. Advanced code generation techniques. Representation of intermediate code. Data flow analysis, code movement, loop optimization, common subexpression elimination, and peephole optimization. Optimization by program transformation. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 278C.)

244. Principles of Concurrent Programming (3) I. Olsson
Lecture—3 hours. Prerequisite: course 100, 150 or Electrical and Computer Science Engineering 182B. Fundamental concepts and applications of concurrent programs; concurrent program verification and derivation; synchronization mechanisms in programming languages; distributed programming techniques; case studies of languages.

252. Local Area Networks (3) II. Mukherjee
Lecture—3 hours. Local area networks and their functions, structures, and access protocols. Emphasis on performance modeling and analysis of multiaccess techniques in polling, ring, and random access networks. Also discussed are standards, example products, and recent directions in research.

253. Cryptography and Data Security (3) I, Levitt
Lecture—3 hours. Prerequisite: course 150; consent of instructor. Methods of protecting data in computer and communication systems from unauthorized disclosure and modification. Introduction to mathematical principles of security with applications to operating systems, database systems and computer networks.

***256A. Analytic Methods for Computer Systems Design** (3) II. Matloff
Lecture—3 hours. Prerequisite: course 100, Electrical and Computer Science Engineering 171, Statistics 131A or the equivalent; Electrical and Computer Engineering 182A and 182B recommended. Use of simulation and queueing theory in computer design. Applications to memory hierarchies; file storage; computer networks; fault-tolerance; scheduling. Only one unit of credit allowed to students who have completed former Electrical and Computer Science Engineering 186.

256B. Modeling and Analysis of Computer Networks (3) III. Matloff
Lecture—3 hours. Prerequisite: course 256A. Use of simulation and queueing theory in the design of wide-area and local computer networks, with particular emphasis on op-

timization. Multiple access protocols, capacity planning, topological design, flow/congestion control, routing.

260. Software Engineering (3) I, Fisher, Levitt
Lecture—3 hours. Prerequisite: courses 140, 142, 160. Advanced techniques for program specification, design, implementation, testing, and documentation. Application of techniques to large-scale software systems. (Not open for credit to students who have completed the same topic under Electrical and Computer Science Engineering 289.)

***261. Program Verification** (3) I, Archer
Lecture—3 hours. Prerequisite: Mathematics 125 or Philosophy 112 or familiarity with first-order logic. Knowledge of an iterative and a functional programming language. Methods of proving correctness of programs with respect to formal specifications, with attention to those suited for employing automated deduction. Logic background, symbolic execution, techniques suited to iterative programming, methods from denotational semantics, termination, dynamic logic and proofs of concurrent programs.

***262. Formal Specification** (3) II. Hakimi
Lecture—3 hours. Prerequisite: course 000. Formal specification of modules, and its relationship to top-down programming development and verification. Abstract data types, together with methods for specifying them. Implementations to reason about programs. Parameterized types. Constructing good formal specifications. Offered even-numbered years only.

265. Database Systems (3) III. Kou
Lecture—3 hours. Prerequisite: course 165. Data models (especially relational and entity relation), performance measures, query languages and optimizers, data base security and integrity, and distributed systems. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 280.)

269. MUMPS Language (3) I, Walters
Lecture—3 hours. Prerequisite: course 140. Review of MUMPS language: history, features, implementation techniques, validation procedures, performance evaluation and applications. Projects in programming, meta language implementation, validation and performance measures.

270. Artificial Intelligence (3) III. The Staff
Lecture—3 hours. Prerequisite: course 140; course 170 recommended. Concepts and techniques underlying the design and implementation of models of human performance on intelligent tasks. Representation of high-level knowledge structures. Models of memory and inference. Natural language and story understanding. Common sense planning and problem solving. (Not open for credit to students who have completed former Electrical and Computer Science Engineering 279.)

272. Cognitive Modeling (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 170 and 270. Current issues in artificial intelligence emphasizing the modeling and simulation of human performance. Discussion and implementation of current methods in knowledge representation, memory processes and organization, natural language understanding, and planning and problem solving.

***274. Automated Deduction** (3) III. Archer
Lecture—3 hours. Prerequisite: Mathematics 125 or Philosophy 112 or familiarity with first-order logic. Techniques of mechanical theorem-proving. Methods based on resolution and term-rewriting. Decision procedures. Induction. Applications to program verification, question/answering and plan generation. Offered in even-numbered years.

275. Computer Graphics (3) II. Joy
Lecture—3 hours. Prerequisite: course 175. Advanced topics in computer graphics. Hidden surface models, rendering of various surface types, subdivision methods, shading techniques, anti-aliasing, modeling techniques.

***276. Advanced Raster Graphics** (3) III. Joy
Lecture—3 hours. Prerequisite: course 275. Advanced topics in raster graphic techniques. Ray tracing models, advanced modeling techniques, anti-aliasing, animation. Discussion of current research in the field.

278. Computer-Aided Geometric Design (3) III. Joy
Lecture—3 hours. Prerequisite: course 175; Applied Science Engineering 115 or Mathematics 128A. Mathematical techniques for the definition and manipulation of curves and surfaces. Coon's patches, Bezier curves and surfaces. B-spline curves and surfaces, beta-splines, box-splines. Integration into various computer graphics rendering models, and computer-aided design systems.

289A-K. Special Topics in Computer Science (1-5) I, II, III. The Staff
Lecture, laboratory, or combination. Prerequisite: consent of instructor. Special topics in (A) Computer Science Theory; (B) Architecture; (C) Programming Languages and Compilers; (D) Operating Systems; (E) Software Engineering; (F) Data Bases; (G) Artificial Intelligence; (H) Computer Graphics; (I) Networks; (J) Computer-Aided Design; (K) Scientific Computing. May be repeated for credit when the topic is different.

290. Seminar in Computer Science (1) I, II, III. The Staff Seminar—1 hour. Participating seminar; discussion and presentation of current research and development in computer science. (S/U grading only.)

290C. Graduate Research Group Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion—1 hour. Research problems, progress and techniques in computer science. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff
Lecture, laboratory, or combination. Prerequisite: consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
(S/U grading only.)

Professional Course

390. The Teaching of Computer Science (1) I, II, III. The Staff
Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in Computer Science. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit.

Engineering: Mechanical

(College of Engineering)

Harry Brandt, Ph.D., Chairperson of the Department

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Faculty

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Harry Brandt, Ph.D., Professor
John W. Brewer, Ph.D., Professor
Harry A. Dwyer, Ph.D., Professor (Aeronautical Science and Engineering)
Andrew A. Frank, Ph.D., Professor
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Joseph L. Steger, Ph.D., Adjunct Professor
John B. Stek, Ph.D., Lecturer
Cornelis P. van Dam, Ph.D., Assistant Professor
(Aeronautical Science and Engineering)
Robert F. Warming, Ph.D., Adjunct Professor
Bruce R. White, Ph.D., Professor
(Aeronautical Science and Engineering)
An Tzu Yang, D.E.Sc., Professor

Division of Aeronautical Science and Engineering

Faculty

James W. Baughn, Ph.D., Professor
Don O. Brush, Ph.D., Professor (Civil Engineering)
James A. Cheney, Ph.D., Professor (Civil Engineering)
Harry A. Dwyer, Ph.D., Professor
³Mohamed Hafez, Ph.D., Professor
⁴Leonard R. Herrmann, Ph.D., Professor
(Civil Engineering)
^{3,4}Ronald A. Hess, Ph.D., Professor
Myron A. Hoffman, Sc.D., Professor
²Mont Hubbard, Ph.D., Professor
James R. Hutchinson, Ph.D., Professor
(Civil Engineering)
²Wolfgang Kollmann, Dr.-Ing, Professor
Cornelis P. van Dam, Ph.D., Assistant Professor
Bruce R. White, Ph.D. Professor
Harry Wolff, B.S., Lecturer

Division of Materials Science and Engineering

Faculty

³Jeffery C. Gibeling, Ph.D., Assistant Professor
David G. Howitt, Ph.D., Associate Professor
Amiya K. Mukherjee, D.Phil., Professor
Zuhair A. Munir, Ph.D., Professor
Howard L. Needles, Ph.D., Professor
(Textiles and Clothing)
James F. Shackelford, Ph.D., Professor
S. Haig Zeronian, Ph.D., D.Sc., Professor
(Textiles and Clothing)

Courses in Engineering: Mechanical

(Courses in Mechanical Engineering are listed below; courses in Aeronautical Science and Engineering and Materials Science and Engineering are listed immediately following.)

Lower Division Courses

- 1. Mechanical Engineering** (1) II. The Staff (Brandt 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 (Brandt 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 (Brandt in charge)
Prerequisite: consent of instructor; lower division standing. (P/NP grading only.)

Upper Division Courses

- 134. Vehicle Stability** (4) III. Karnopp
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 171 and Engineering 102B. Introduction to static and dynamic stability characteristics of ground transportation vehicles. Examples drawn from automobiles, trains, articulated vehicles, motorcycles, bicycles and others. Lateral handling characteristics, oversteer understeer. Laboratory experiments illustrate effects of vehicle parameters on dynamic vehicle response.
- 150A. Mechanical Design and Manufacturing Processes** (4) I, III. Ravani, Beadle.
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** (4) I, II. Frank, Ravani
Lecture—3 hours; discussion—1 hour. Prerequisite: course 150A. Principles of engineering mechanics, failure theories and fatigue theory applied to design and selection of me-

chanical components. Design projects which concentrate on conceptual design, engineering analysis, methods of manufacture, material selection and cost. Introduction to computer-aided-design.

151. Statistical Methods in Design (3) II. Beadle
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.

162. Gas Turbines for Propulsion and Power Generation (4) II. Hoffman
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.

***163. Introduction to Combustion Phenomena** (4) I, Law
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B. Fundamentals of combustion phenomena including thermal explosion, diffusion flames, premixed flames, detonation, ignition and extinction, turbulent and two-phase combustion, and flame aerodynamics. Applications of combustion in gasoline engines, diesel engines, gas turbines, and industrial furnaces.

165. Fundamentals of Heat Transfer (4) I, II. McKillop, Dwyer
Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 5, 103B and 105B. Fundamentals of conduction, convection and radiation heat transfer; applications to engineering equipment with use of digital computers.

171. Analysis, Simulation, and Design of Dynamic Systems (4) I, II. Karnopp, Margolis
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A, Engineering 102B and 180. Modeling of dynamic engineering systems in various energy domains. Analysis of response of linear system models. Digital computer simulation.

172. Automatic Control of Engineering Systems (4) II. Brewer
Lecture—3 hours; discussion—1 hour. Prerequisite: course 171. Classical feedback control for engineering systems. Control system design using time and frequency domain methods. State space techniques.

***173. Design of Computer Controlled Dynamic Mechanical Systems.** (3) III. Frank
Lecture—3 hours. Prerequisite: course 172. Introduction to discrete systems, correlation with continuous systems, design of computer algorithms to control continuous mechanical dynamic systems.

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.

184A. Mechanical Engineering Design Project (2) I, II, III. The Staff
Laboratory—6 hours. Prerequisite: senior standing in Mechanical Engineering; consent of instructor. Performance of a major design project which includes design and possible development and evaluation of mechanical engineering system.

184B Mechanical Engineering Design Project (2) I, II, III. The Staff
Laboratory—6 hours. Prerequisite: course 184A; consent of instructor. Performance of projects which include design and possible development and evaluation of a mechanical engineering system.

185. Mechanical Systems Design Projects (4) III. Ravani
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of mechanical systems. Engineering case studies will help to illustrate the engineering design process and its use in design of engineering systems. Grading based on individual contributions to projects.

186. Thermal Systems Design Project (4) III. Kennedy
Lecture—3 hours; discussion—1 hour. Prerequisite: course 165; senior standing in Mechanical Engineering or Physics (enrollment preference to students who have not taken any of course series, 184-188). Design of a thermal system such as a power plant or engine, including consideration of en-

engineering and economic factors. Grading based on individual contributions to project. Limited enrollment.

187. Control Systems Design Project (4) III. Frank
Lecture—3 hours; discussion—1 hour. Prerequisite: course 172; senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of dynamic engineering systems. Formulation of goals, mathematical modeling of plant, consideration of passive, open loop, and closed loop active solutions. Hardware and cost/performance considerations. Grading based on individual contributions to projects.

188. Vehicle Systems Design Project (4) II. Frank
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 150B; senior standing in Mechanical Engineering (enrollment preference to students who have not taken any of course series, 184-188). Design of vehicle systems, including components, and/or complete vehicles for groups or individuals. Students will design, analyze, construct and evaluate a vehicle related component. Grading based on individual contributions to projects. Limited enrollment.

192. Internship in Engineering (1-5) I, II, III. The Staff (Brandt 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 (Brandt in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Brandt 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 the Thermal Sciences (3) I. Baughn
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 165. Experiment design, statistics uncertainty analysis. Steady-state and transient temperature measurement. Steady-state flow and pressure measurements.

208B. Experimental Methods in Fluid Mechanics and Combustion (3) III. Kennedy
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 165 and 103B. Application of shadow, schlieren and other flow visualization methods. Introduction to optics and lasers. Measurement of velocity and concentrations in reacting and non-reacting flows with laser diagnostic techniques including LDV, Rayleigh, Raman and Fluorescence scattering and CARS. Offered in even-numbered years.

208C. Hot-Wire Anemometry (2) III. White
Lecture—1 hour; laboratory—3 hours. Prerequisite: Engineering 103B. Introduction to hot-wire anemometry and its application to measurements of turbulent flow properties. Offered in odd-numbered years.

210A. Advanced Fluid Mechanics and Heat Transfer (4) I. Dwyer
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B, course 165, graduate student standing. Development of differential equations governing continuity, momentum and energy transfer. Solutions in laminar flow for exact cases, low and high Reynolds numbers and lubrication theory. Dynamics of inviscid flow.

210B. Advanced Fluid Mechanics and Heat Transfer (4) II. Kollmann
Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A. Study of stability and transition to turbulence. Introduction to the physics of turbulence. Modeling of turbulence for numerical determination of momentum and heat transfer.

210C. 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.

211. Fluid Flow and Heat Transfer Design (4) I. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 210A (may be taken concurrently) or consent of instructor. Design aspects of selected topics such as: heat conduction, thermal stresses, fins; heat transfer in ducts, boundary layers and separated flows; impingement and film cooling; heat exchangers; flow in diffusers, flow over airfoils and blades. Offered in odd-numbered years.

212. Advanced Heat Transfer with Phase Change (4) III. Hoffman

Lecture—3 hours; discussion—1 hour. Prerequisite: course 165. Study of complex phenomena occurring in two-phase flow, boiling and condensation. Development of fundamental relations. Use of these relations with experimental data to develop semi-empirical working relations; application to various energy system and power-plant problems. Offered in 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 simplification; numerical methods; application to boundary layer-type flows; two-dimensional and three-dimensional hydraulic and environmental flows. Offered in even-numbered years.

216. Advanced Thermodynamics (4) I. Kennedy
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 105B. Study of topics important to energy conversion systems, propulsion and other systems using high temperature gases. Classical thermodynamics and quantum statistical mechanics of nonreacting and chemically reacting gases, gas mixtures, and other substances.

217A. Principles of Combustion (4) II. Law
Lecture—3 hours; discussion—1 hour. Prerequisite: course 103B or 105B. Advanced treatment of the theory of chemically-reacting flows. Detailed discussions on governing equations and analytical techniques, chemical kinetics, structures of diffusion flames, premixed flames, and detonation waves.

217B. Advanced Combustion (4) III. Law
Lecture—3 hours; discussion—1 hour. Prerequisite: course 217A. Detailed study of complex combustion phenomena including flame stabilization, flamefront instability, detonation structure, ignition and extinction phenomena, turbulent combustion, boundary layer combustion, and two-phase combustion. Offered in even-numbered years.

218. Advanced Energy Systems (4) I. Hoffman
Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B, 105B, or the equivalent. Review of options available for advanced power generation. Detailed study of basic power balances, component efficiencies, and overall powerplant performance for one advanced concept such as a fusion, magnetohydrodynamic, or solar electric powerplant. Offered in even-numbered years.

220A-220B. Mechanical Vibrations (3-3) II-III. Margolis
Lecture—3 hours. Prerequisite: Engineering 122. Applications of vibration theory to systems with many degrees of freedom and continuous systems. Introduction to random vibrations.

222. Advanced Dynamics (3) I. Karnopp
Lecture—3 hours. Prerequisite: Engineering 102B. Dynamics of particles and of rigid bodies with advanced engineering applications; generalized coordinates; Hamilton's Principles; Lagrange's Equations; Hamilton-Jacobi theory. Offered in even-numbered years.

224. Kinematic Design of Mechanisms (3) II. Yang
Lecture—3 hours. Prerequisite: course 152 or consent of instructor. Introduction to Bernoulli's theory of the rational design of link mechanisms. Geometric concept of two- and three-dimensional rigid-body displacements, instantaneous invariants, higher order path curvature analysis, circle- and center-point curves. Graphic and computer methods for kinematic design. Offered in even-numbered years.

225. Spatial Kinematics and Robotics (3) II. Yang
Lecture—3 hours. Prerequisite: course 222 or consent of instructor. Spatial kinematics: point and line coordinates and their transformations; concept of screw systems and instantaneous invariants for rigid body motion. Robotics: solving for kinematic equations; differential relationships; motion trajectories. Application of dual-number matrices, screw calculus, and associated analytical methods. Offered in odd-numbered years.

***226. Acoustics and Noise Control (3) I.** Hubbard
Lecture—3 hours. Prerequisite: Engineering 122. Description of sound using normal modes and waves; interaction between vibrating solids and sound fields; sound absorption in enclosed spaces; sound transmission through barriers; applications in design of mufflers, acoustic enclosures, room acoustics, design of quiet machinery. Offered in even-numbered years.

***250. Project Engineering (3) III.** Hendersson
Lecture—2 hours; discussion—1 hour. Planning, organization, and management of engineering projects. Studies of selected problems which illustrate the design process and management methods in advanced mechanical engineering systems. Experience with leading a project.

255. Computer-Aided Mechanical Design (3) III. Ravani
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. Margolis

Lecture—3 hours. Prerequisite: course 172 or consent of instructor. Multiport models of mechanical, electrical, hydraulic and thermal devices; bond graphs, block diagrams and state space equations; Hamilton's principle for complex systems; formulation for analog and digital simulation; identification; instrumentation, approximate models of distributed systems.

271. Design of Multivariable Control Systems (3) II. Hubbard
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-single-output systems. Equal emphasis on digital and continuous control and on 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 linear quadratic control. Multivariable Nyquist arrays. Introduction to singular value analysis and the design of robust control systems.

274. Analysis and Design of Digital Control Systems (3) III. Frank
Lecture—3 hours. 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.

276A. Digital Data Acquisition and Analysis (3) I. Gibeling
Lecture—2 hours; discussion—1 hour. Prerequisite: course 176. Application of microcomputers and minicomputers to data acquisition and control. Topics include computer organizations, hardware for laboratory applications of computers, fundamentals of interfaces between computers and experimental equipment, programming techniques for data acquisition and control and basic data analysis.

276B. Digital Data Acquisition and Analysis (3) II. Hull
Lecture—2 hours; discussion—1 hour. Prerequisite: course 276A. Theory and application of modern techniques in digital data analysis. Topics include statistical description of data, convolution and correlation, and frequency analysis using the discrete Fourier transform. Emphasis on applying these techniques in the experimental characterization of linear dynamic systems.

277. Computer-Aided Design of Nonlinear Dynamic Systems (3) III. Karnopp
Lecture—2 hours; discussion—1 hour. Prerequisite: courses 270, 271. Application of bond graph modeling and control system design principles. The bond graph processor programs ENPORT and CAMP are used with advanced continuous system modeling programs to simulate the dynamic response of engineering systems.

280. Advanced Engineering Analysis (3) I. Brandt
Lecture—3 hours. Prerequisite: Engineering 180 or the equivalent. Applications in mechanical engineering or advanced analytical and numerical techniques. Topics include probability theory, calculus of variations, classification of differential equations, and advanced numerical methods.

289A-289B. Special Topics in Mechanical Engineering (1-5) I, II, III. Hull
Lecture—1-5 hours. Prerequisite: consent of instructor. Special topics in (289A) musculo-skeletal system biomechanics; (289B) orthopaedic biomechanics.

290. Seminar (1) I, II, III. The Staff (Brandt in charge)
Seminar—1 hour. (S/U grading only.)

290C. Graduate Research Conference (1) I, II, III. The Staff (Brandt in charge)
Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress and techniques in mechanical engineering research. May be repeated for credit. (S/U grading only.)

295. Design Seminar (1) I, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion 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. The Staff Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of the current literature and trends in fluid mechanics and thermal sciences. (S/U grading only.)

297. Dynamic Systems and Control Theory Seminar (1) I, III. The Staff Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in system theory and automatic control with presentations by individual students. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Brandt in charge)

299. Research (1-12) I, II, III. The Staff (Brandt in charge) (S/U grading only.)

Professional Course

390. The Teaching of Mechanical Engineering (1) I, II, III. The Staff (Brandt in charge) Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in mechanical engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

Courses in Aeronautical Science and Engineering

Lower Division Course

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: consent of instructor and lower division standing. (P/NP grading only.)

Upper Division Courses

125. Aeronautical Engineering Fundamentals (3) II. Rehfield 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. Hafez 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, van Dam 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. White 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. Hubbard 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. van Dam Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: courses 128 and 129. Aircraft preliminary design including estimation of weight/ volume, aerodynamics, performance, stability and control. Design iteration and trade-off studies.

131. Aircraft Flight Performance Laboratory (3) III. Baughn Lecture 1 hour; discussion 1 hour; laboratory—3 hours. Prerequisite: course 125. Measurements and analysis of aircraft characteristics and performance, in flight and with flight simulator.

132. Rocket and Ramjet Propulsion (4) II. Wolff Lecture—3 hours; laboratory—3 hours. Prerequisite: Engineering 103B and 105A. Gas dynamics for propulsion; combustion principles; solid, liquid and hybrid propellant rockets; ramjet propulsion; liquid- and solid-fueled ramjets.

135. Aerospace Structures (3) II. Rehfield Lecture—3 hours. Prerequisite: course 104B (may be taken concurrently). Introduction to methods used in the analysis and design of aircraft structures. Shear flow in open, closed

and multicell beam cross sections, buckling of flat and curved sheets, tension field beams, local buckling.

137. Structural Composites (4) III. Rehfield Lecture—3 hours; laboratory—1 hour. Prerequisite: course 104B. Overview of materials and technology for creating structures from fiber reinforced resin matrix composite material systems. Elementary design analysis and case studies emphasizing aeronautical applications.

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

***230. Advanced Aerodynamics-Inviscid Flow** (4) II. Hafez Lecture—4 hours. Prerequisite: courses 126 and 127. Inviscid theory. Nonlinear effects in subsonic and supersonic flows. Transonic aerodynamics. Offered in odd-numbered years.

232. Advanced Aerodynamics-Viscous Flow (4) I, van Dam Lecture—4 hours. Prerequisite: Engineering 103B. Discussion of boundary-layer theory, laminar and turbulent boundary layers, laminar boundary-layer instability and transition, separation, viscous/inviscid interaction, three-dimensional flows and computational methods and their application. Offered in even-numbered years.

234. Computational Aero and Fluid Dynamics (4) III. Hafez Lecture—4 hours. Prerequisite: Engineering 103B. Discretization techniques. Consistency, convergence and stability of difference schemes. Iterative methods for large nonlinear systems of equations. Applications of Euler and Navier-Stokes equations. Offered in even-numbered years.

236. Aerodynamics in Nature and Technology (4) I. White Lecture—3 hours; discussion—1 hour. Prerequisite: Engineering 103B. Introduction to aerodynamics in nature, fundamentals of turbulence in atmospheric flows, planetary boundary layers, wind effects on man-made objects, pedestrian-level winds in urban areas. Criteria for laboratory modeling of atmospheric flows, wind-tunnel testing, extra-terrestrial aerodynamics. Offered in odd-numbered years.

237. Analysis and Design of Composite Structures (4) I, Rehfield Lecture—3 hours; discussion—1 hour. Prerequisite: course 137. Modeling and analysis methodology for composite structures including response and failure. Laminated plate bending theory. Introduction to failure processes.

275. Advanced Topics in Aircraft Stability and Control (3) III. Hess

Lecture—3 hours. Prerequisite: course 129 or Mechanical Engineering 134; and Mechanical Engineering 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.

289A-G. Special Topics in Aerodynamics (4) III. van Dam Lecture—4 hours. Prerequisite: consent of instructor. One of the following topics: (A) Unsteady Aerodynamics and Flutter Analysis; (B) Advanced Aerodynamic Design and Optimization; (C) Wind Tunnel Testing and Wall Interference; (D) Hypersonic Flow; (E) Rarefied Gas Dynamics; (F) Atmospheric Boundary Layers; (G) Nonlinear Stability Theory and Transition to Turbulence. Offered in odd-numbered years.

290C. Graduate Research Conference (1) I, II, III. The Staff (Brandt in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress and techniques in mechanical engineering research. May be repeated for credit. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) Prerequisite: consent of instructor. (S/U grading only.)

Professional Course

390. The Teaching of Aeronautical Science and Engineering (1) I, II, III. The Staff

Discussion—1 hour. Prerequisite: meet qualifications for teaching assistant and/or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated for credit. (S/U grading only.)

Courses in Materials Science and Engineering

Upper Division Courses

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Brandt in charge)

Prerequisite: consent of instructor. P/NP grading only.

(All other undergraduate courses in Materials Science and Engineering are listed under Engineering core courses as Engineering 130 through 149, inclusively.)

Graduate Courses

230. Fundamentals of Electron Microscopy (3) II. Howitt Lecture—2 hours; discussion—1 hour. Prerequisite: Engineering 132. Principles and techniques of scanning and transmission of electron microscopy used in the study of materials. Emphasis upon practical applications. Offered in even-numbered years.

230L. Laboratory for Electron Microscopy (2) II. Howitt Laboratory—6 hours. Prerequisite: course 230 concurrently. Practical application of techniques of electron scanning and transmission microscopy including x-ray microanalysis. Offered in even-numbered years.

232. Advanced Topics in Transmission Electron Microscopy (3) II. Howitt Lecture—1 hour; discussion—2 hours. Prerequisite: course 230. Advanced course in the techniques of electron microscopy including analytical techniques, probe diffraction methods and high resolution imaging. Offered in odd-numbered years.

232L. Laboratory for Advanced Transmission Electron Microscopy (2) II. Howitt Discussion—1 hour; laboratory—3 hours. Prerequisite: course 232 concurrently. Laboratory in advanced transmission electron microscopy techniques relevant to specific graduate research projects in materials science. Offered in odd-numbered years.

240. Transport Phenomena in Materials Processes (4) III. Howitt

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.

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.

248. Fracture of Engineering Materials (3) I, Gibeling
Lecture—3 hours. Prerequisite: Engineering 138. Description of failure of materials by crack propagation. Topics include the stress fields about elastic cracks, the Griffith-Irwin analysis, descriptions of plastic zones, fracture toughness testing, microstructural aspects of fracture and failure at elevated temperatures. Offered in odd-numbered years.

249. Mechanisms of Fatigue (3) I, Gibeling
Lecture—3 hours. Prerequisite: Engineering 138 or consent of instructor. Microstructural description of mechanisms of fatigue in metals. Topics include a phenomenological treatment of cyclic deformation, dislocation processes in cyclic deformation, fatigue crack nucleation, stage I crack growth, threshold effects and high temperature cyclic deformation. Offered in even-numbered years.

250A-250B-250C-250D-250E-250F. Special Topics in Polymer and Fiber Science (3) II, Zeronian
Lecture—3 hours. Prerequisite: Engineering 147 or consent of instructor. Selected topics of current interest in polymer and fiber sciences. Topics will vary each time the course is offered. (Same course as Textiles and Clothing 250A-250B-250C-250D-250E-250F.)

290C. Graduate Research Conference (1) I, II, III, The Staff (Brandt in charge)
Discussion—1 hour. Prerequisite: consent of instructor. Individual and/or group conference on problems, progress and techniques in materials science and engineering research. May be repeated twice for credit. (S/U grading only.)

294. Materials Science Seminar (1) I, II, III, Shackelford, Mukherjee, Munir, Howitt, Gibeling
Seminar—1 hour. Prerequisite: graduate student in good standing. Review and discussion of current literature and developments in materials science with presentations by individual students. (S/U grading only.)

299. Research (1-12) I, II, III, The Staff (Brandt in charge)
(S/U grading only.)

Professional Course

390. The Teaching of Materials Science (1) I, II, III, The Staff (Brandt in charge)
Discussion—1 hour. Prerequisite: qualifications and acceptance as teaching assistant and/or associate-in in mechanical engineering. Participation as a teaching assistant or associate-in in a designated engineering course. Methods of leading discussion groups or laboratory sections, writing and grading quizzes, use of laboratory equipment, and grading laboratory reports. May be repeated twice for credit. (S/U grading only.)

English

(College of Letters and Science)

Robert H. Hopkins, Ph.D., Acting Chairperson of the Department

Department Office, 114 Sproul Hall

Faculty

- ^{3,4}William E. Baker, Ph.D., Professor
- Max Byrd, Ph.D., Professor
- Everett Carter, Ph.D., Professor
- Christopher Craft, M.A., Acting Assistant Professor
- Peter A. Dale, Ph.D., Professor
- Joanne Feit Diehl, Ph.D., Associate Professor
- ²Elliot L. Gilbert, Ph.D., Professor
- Thomas A. Hanzo, Ph.D., Professor Emeritus
- Wayne Harsh, Ph.D., Professor
(English, Linguistics) Emeritus
- John O. Hayden, Ph.D., Professor
- ⁴Peter L. Hays, Ph.D., Professor
- W. Jack Hicks, Ph.D., Associate Professor
- ¹Michael J. Hoffman, Ph.D., Professor
- Robert H. Hopkins, Ph.D., Professor
- ^{2,3}Michael P. Kramer, Ph.D., Assistant Professor
- ⁴Richard A. Levin, Ph.D., Associate Professor
- Arthur E. McGuinness, Ph.D., Professor
- Sandra J. McPherson, B.A., Associate Professor
- Patricia L. Moran, B.A., Acting Assistant Professor
- Linda A. Morris, Ph.D., Lecturer
- James J. Murphy, Ph.D., Professor
- Gwendolyn B. Needham, Ph.D., Professor Emeritus
- Marijane Osborn, Ph.D., Associate Professor

- David A. Robertson, Ph.D., Associate Professor
- Winfried Schleiner, Ph.D., Professor
- Gwendolyn Schwabe, S.A., Senior Lecturer
- Karl J. Shapiro, Professor Emeritus
- Daniel Silvia, Ph.D., Associate Professor
- Gary Snyder, B.A., Professor
- David Van Leer, Ph.D., Associate Professor
- Raymond B. Waddington, Ph.D., Professor
- Brom Weber, Ph.D., Professor of American Literature Emeritus
- Robert A. Wiggins, Ph.D., Professor
- Alan B. Williamson, Ph.D., Professor
- James L. Woodress, Ph.D., Professor Emeritus
- 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 Teaching or 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
English 45	4
English 30A, 30B, 46A, 46B, 46C	20
Depth Subject Matter (for each emphasis, see below)	44
Core requirement	28
A. <i>Historical Periods</i>	16
One course from each of the following five areas	
1) British literature, beginnings to 1500: English 111, 150A	
2) British literature, 1500-1660: English 118, 120, 150B	
3) British literature, 1660-1832 or American literature, 1620-1800: English 125, 127, 140, 141, 155A	
4) Nineteenth-century British or American literature: English 130, 132, 133, 134, 143, 144, 155B, 155C, 158A	
5) Twentieth-century British or American literature: English 136, 137, 138, 139, 146, 147, 150D, 152, 155D, 158B, 179, 181, 183	
B. <i>Major Authors</i>	6
Two courses in different authors selected from English 113A, 113B, 117A, 117B, 117C, 122. Courses used to meet this requirement may not duplicate courses chosen to meet the historical periods requirement.	
C. <i>Senior Seminar</i>	4
One course selected from English 187, 188, 189.	
The following courses—English 107, 110A, 110B, 171A, 171B, 173, 175, 179, 180, 181, 182, 183, 184, 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, 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	44
Core requirements (see above)	28

One course from language/linguistics group: English 105A, 105B, 105C, 105D, 107	4
Twelve elective units in upper division English courses	12
Total Units for the Major	68

Teaching Emphasis

Depth Subject Matter	44
Core requirement, same as for (General) major above, but must include one course from English 117A, 117B, or 117C	28
English 103A-G, 105A, 105B	12
One course selected from English 179, 181, or an ethnic literature course from outside the English department	4
Total Units (Teaching Emphasis)	68

Writing Emphasis

Depth Subject Matter	44
Core requirement, same as for (General) major above	28
One course from the language and linguistics group: English 105A, 105B, 105C, 105D, 107	4
Twelve units in English 100F, 100P and/or 100NF	12
Total Units (Writing Emphasis)	68

English Majors

Up to four upper-division units in a national literature other than English or American, or in Comparative Literature, may count toward the requirements of the major.

Minor Program Requirements:

	UNITS
English	20
Five upper-division courses, four of which will be literature courses	20

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. English 1 or 3 is required for admission into courses 30A, 30B, 45, 46A, 46B, 46C, and all upper division courses. Course 45 is recommended as preparation for the 30 and 46 series. Students taking course 30A, 30B, 45, 46A, 46B, or 46C for General Education credit may substitute Comparative Literature 1, 2, or 3 for English 1 or 3.

Meeting for Majors. All English majors are required to attend a general meeting for majors at the beginning of each year; all new and transfer English majors are required to attend a general meeting for majors at the beginning of their first quarter in residence; all English majors must see their advisers, individually, in the spring quarters of their sophomore and junior years.

Major Advisers. W. E. Baker, M. Byrd, E. Carter, C. Craft, P. A. Dale, E. L. Gilbert, J. O. Hayden, P. L. Hays, W. J. Hicks, R. H. Hopkins, M. P. Kramer, R. A. Levin, A. E. McGuinness, S. J. McPherson, P. L. Moran, L. A. Morris, M. Osborn, D. A. Robertson, W. Schleiner, D. Silvia, D. Van Leer, R. B. Waddington, R. A. Wiggins, A. B. Williamson, K. F. Zender.

Foreign Languages. Students who contemplate advanced study in English should prepare for foreign

language requirements for higher degrees, and should consult with the graduate adviser.

Honors and Honors Program. Refer to the Academic Information section and the College section for Dean's Honors List information.

Teaching Credential Subject Representative. R. A. Wiggins. See also under Teacher Education Program.

Graduate Study. The Department of English offers programs of study and research leading to the M.A. and Ph.D. degrees. Detailed information may be obtained from the graduate adviser or the Chairperson of the Department.

Graduate Adviser. W. Schleiner.

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 (0) 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.

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. General Education credit: Civilization and Culture/Introductory.

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: course 1 or 3. Emphasis on the grammatical patterns of standard English, sentence revision techniques, development of coherent paragraphs, and the formal properties of the expository essay.

21. Introduction to Reading and Composition in ESL (5) I, II. The Staff (Morris in charge) Lecture-discussion—5 hours. Prerequisite: enrollment by placement examination only. Course provides undergraduate students whose native language is not English with intensive work in reading for factual information and in writing organized, coherent, and grammatically correct paragraphs. Students also study elements of the academic essay. (P/NP grading only.)

22. Reading and Composition in ESL (4) I, II, III. The Staff (Morris in charge) Lecture-discussion—4 hours. Prerequisite: enrollment by placement examination or by successful completion of course 21. Course provides undergraduate students whose native language is not English with experience in writing complete short essays in recognized rhetorical modes, such as definition, comparison, and analysis. Students also read for reference and work on sentence structure. (P/NP grading only.)

23. Advanced Reading and Writing in ESL (4) I, II, III. The Staff (Morris in charge) Lecture-discussion—4 hours. Prerequisite: enrollment by placement examination or by successful completion of course 22. Course provides students whose native language is not English with experience with the conventions of English language logic and with writing persuasive essays. Students also asked to read for tone, style, context, and assumptions. (P/NP grading only.)

25. English for Foreign Students (5) I, II, III. Schwabe Lecture—3 hours; laboratory—4 hours; laboratory—1 hour. Prerequisite: enrollment by Examination in English placement; open to international graduate students only. Course develops skills needed by the graduate student: note-taking on lectures and on written academic discourse, writing logically developed essays accurately under time pressure, using thinking strategies implicit in objective testing, systematically extending vocabulary, and writing a research paper. May be repeated for credit.

26. English for Foreign Students (5) II, III. Schwabe Lecture—3 hours; laboratory—4 hours; laboratory—1 hour. Prerequisite: satisfactory completion of course 25; open to international graduate students only. Continuation of work in course 25, with additional focus on oral skills.

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; II, Van Leer Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. American literature from the seventeenth century to 1865. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

30B. Survey of American Literature (4) II, Hays; III, Morris Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. American literature from 1865 to the present. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

45. Close Reading of Poetry (4) I, II, III. The Staff (Chairperson in charge) Lecture-discussion—4 hours. Prerequisite: course 1 or 3. Close reading of selections from English and American poetry. Frequent written exercises. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

46A. Masterpieces of English Literature (4) I, Waddington; II, Silvia Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. Selected works of principal writers to 1640. History of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

46B. Masterpieces of English Literature (4) II, Levin; III, Hayden Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or 3. Selected works of principal writers from 1640 to 1832. History of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

46C. Masterpieces of English Literature (4) I, McGuinness; II, Moran; III, Craft Lecture-discussion—4 hours. Prerequisite: course 1 or 3. Selected works of principal writers from 1832 to present. The history of literary conventions and backgrounds in religious thought, intellectual and social history, and related art forms. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

92. Internship in English (1-12) I, II, III. The Staff (Chairperson in charge) Fieldwork—3-36 hours. Prerequisite: course 1 or 3. Internships in fields where students can practice their skills. May be repeated for credit for a total of 12 units. (P/NP grading only.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: one course from 1, 3, 5F, 5P. (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: course 1 or 3, or consent of instructor; priority given to English (Creative Writing) majors. Writing of non-fiction. May be repeated for credit with consent of instructor. No final examination.

100P. Creative Writing: Poetry (4) I, II, III. The Staff (Chairperson in charge) Discussion—4 hours; development and evaluation of written materials, and conferences with individual students. Prerequisite: course 5F or 5P, or consent of instructor; priority given to English (Creative Writing) majors. Writing of poetry. May be repeated for credit with consent of instructor. No final examination.

102. Adjunct Writing (3) I, II, III. The Staff (Morris in charge) Discussion—3 hours. Prerequisite: course 1 or 3; concurrent enrollment in a subject-matter discipline. Instruction in the elements of expository writing, with special emphasis on their application to writing projects in a specified academic discipline. May be repeated once for credit if taken in conjunction with a different subject-matter course.

103A-G. Advanced Composition (4) I, II, III. The Staff (Morris in charge) Lecture-discussion—3 hours; individual evaluations and conferences—1 hour. Prerequisite: course 1 or 3; course 20 recommended. Instruction and practice in a variety of modes of composition. Frequent written assignments. One area required of teaching credential candidates (section "F" strongly recommended). Study areas are: (A) General; (B) Legal Writing; (C) Article Writing; (D) Report Writing; (E) Technical Writing; (F) Composition for Elementary and Secondary Teachers; (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. Lecture-discussion—3 hours; term paper. Prerequisite: course 1 or 3. Present-day English grammar and pronunciation according to the perspectives of traditional grammar and contemporary linguistics. Preparation for stylistic analysis and historical study of English language and literature. Required of teaching credential candidates.

105B. Language (4) II. Schleiner Lecture-discussion—3 hours; term paper. Prerequisite: course 1 or 3. History of the English language. Examination of the language as recorded from Old English to present-day English. Relationship of English to other languages; development of vocabulary, phonology, and grammatical patterns. Required of teaching credential candidates.

***105C. Language Change Reflected in Literature (4) III.** Lecture-discussion—3 hours; term paper. Prerequisite: course 1 or 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)** 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)** Seminar—3 hours; special project. Prerequisite: course 1 or 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: course 1 or 3. Essentials of literary criticism and its history from Aristotle to the modern era, with emphasis on the major critics.

***110B. Introduction to Principles of Criticism** (4) Hayden
Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. History of literary criticism in the modern era, with
emphasis on the ties with the past and the special problems
presented by modern literary theory.

***111. Medieval Literature** (4) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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 liter-
ature. Mostly in translation.

113A. Chaucer: *Troilus* and the *Minor Poems* (4) I, Osborn
Lecture—3 hours; term paper. Prerequisite: course 1 or 3.
Development of the poet's artistry and the evolution of the
poet's ideas from his first work to his culminating masterpiece,
Troilus and Criseyde. Courses 113A and 113B need not be
taken in sequence.

113B. Chaucer: *The Canterbury Tales* (4) II. Silvia
Lecture—3 hours; term paper. Prerequisite: course 1 or 3.
The Canterbury Tales complete as a work of art. Courtly
love, literary forms, medieval science and astrology, theology
and dogma as they inform the reading of Chaucer. Courses
113A and 113B need not be taken in sequence.

***116. Sixteenth-Century Poetry and Prose** (4)

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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, Waddington; II,
Zender

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Selected major works from Shakespeare's early
period, up to 1599. Courses 117A-117B-117C need not be
taken in sequence.

117B. Shakespeare: The Middle Period (4) I, Levin; III, Schleiner
Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Selected major works from Shakespeare's middle
period, up to 1604. Courses 117A-117B-117C need not be
taken in sequence.

117C. Shakespeare: The Later Works (4) II, Waddington; III,
Zender

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Selected major works from Shakespeare's later period.
Courses 117A-117B-117C need not be taken in sequence.

***118. Shakespeare** (4) Silvia

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Selected major works by Shakespeare. Recommended
for non-majors. May not be applied toward the English major.
General Education credit: Civilization and Culture/Non-Intro-
ductory. Recommended GE prerequisite: any course from
the GE Literature Prerequisite List.

***120. Earlier Seventeenth-Century Poetry and Prose** (4)

Lecture-discussion—3 hours; term paper or the equivalent.
Prerequisite: course 1 or 3. Major authors, forms, and styles.
Donne, Jonson, Marvell, Bacon, Browne, Hobbes. Tradition
and revolution.

122. Milton (4) II, Levin

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Selected major works, including *Paradise Lost*.

125. The Age of Swift and Pope: Prose and Poetry (4) II, Byrd
Lecture-discussion—3 hours; term paper or the equivalent.
Prerequisite: course 1 or 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)
III, Hopkins

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Readings in Johnson, Goldsmith, Boswell, and others;
the poetry of the era concluding with Blake. General Education
credit: Civilization and Culture/Non-Introductory. Recom-
mended GE prerequisite: any course from the GE Literature
Prerequisite List.

130. Early Romantic Literature (4) II, Hayden

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Blake, Burns, Wordsworth, Coleridge, Scott; the
eighteenth century background and the development of Rom-
antic concepts of imagination.

132. Later Romantic Literature (4) III.

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Byron, Shelley, Keats. Individualism and revolt.

133. Early Victorian Literature (4) I, Dale

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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)

Lecture-discussion—3 hours; term paper. Prerequisite: course

1 or 3. Ruskin, Hardy, Hopkins, and others. The Oxford
movement, the Pre-Raphaelites; art and sociology; aes-
theticism and decadence; pessimism. Tendencies continuing into
the Edwardian period.

136. British Literature from 1880 to 1918 (4) III, Craft

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Yeats, Conrad, Joyce. Aestheticism, naturalism, sym-
bolism, and impressionism. Transition from Victorian to
twentieth-century styles and attitudes.

137. British Literature from 1918 to 1940 (4) I, Moran

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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) II, Wil-
liamson

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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) II, McGuinness

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. A study of Yeats, Joyce, George Moore, John Synge,
James Stephens and others.

***140. Origins of American Literature** (4) Van Leer

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Seventeenth-century American literature; special
attention to European literary-intellectual traditions, dominant
American forms (poems, sermon, history), and major writers
(Anne Bradstreet, Edward Taylor and others).

141. The American Enlightenment and Its Reaction (4) I, Van
Leer

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Eighteenth-century American literature; rise of neo-
classicism, 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) II.

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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 Haw-
thorne and Melville; Emily Dickinson.

144. American Literature from 1865 to 1914 (4) III, Van Leer

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Religion, local color, social criticism, naturalism, *fin
de siècle* aestheticism; Twain, James, Crane, Dreiser, How-
ells.

146. Modern American Literature: 1914-1940 (4) I, Zender
Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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) II,
Hicks

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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: course
1 or 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) II, Waddington

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Shakespeare's contemporaries in the drama, including
Webster, Jonson, Beaumont and Fletcher, and others. The
revenge play and tragicomedie; post-Shakespearean de-
velopment of dramatic action and blank verse.

150D. British Drama from 1890 to the Present (4) II, Craft

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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: course
1 or 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, Byrd

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Realism and the rise of the modern novel. Defoe,
Richardson, Fielding, Sterne, and Smollett.

155B. The English Novel: 1770-1850 (4) III, Dale

Lecture—3 hours; extensive writing (includes 5 two-page
position papers). Prerequisite: course 1 or 3. Evolution of

the novel from 1770-1850 with particular emphasis on the
invention of the Gothic novel (Radcliffe, Mary Shelley), in-
vention of the historical novel (Sir Walter Scott), and con-
tribution of women writers to fiction (Jane Austen, Emily,
Charlotte and Anne Bronte).

155C. The English Novel: 1850-1900 (4) II, Dale

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Major Victorian novelists: their theory and practice.
Dickens, Thackeray, Trollope, Eliot, Meredith, and Hardy.

155D. The English Novel: 1900 to the Present (4) III, Mc-
Guinness

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 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)

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. The short story as a genre; its historical development,
techniques, and formal character as a literary form. European
as well as American writers.

158A. The American Novel to 1900 (4) I, Van Leer

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Rise and development of the American novel from
its beginnings. Hawthorne, Melville, Twain, and others.

158B. The American Novel from 1900 to the Present (4) II,
Hays

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Major American novelists of the twentieth century.
Faulkner, Hemingway, Fitzgerald, and others.

***171A. The Bible as Literature: The Old Testament** (4) Rob-
ertson

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. May be taken independently of course 171B. Selected
readings from the Old Testament illustrating various literary
forms. Emphasis on the Pentateuch, the Historical Books,
and the Wisdom Books. Offered in even-numbered years.
General Education credit: Civilization and Culture/Non-Intro-
ductory. Recommended GE prerequisite: History 4A, 4B,
4C, Philosophy 1, 10B, Religious Studies 21, 40, or any
course from the GE Literature Prerequisite List.

171B. The Bible as Literature: Prophets and New Testament
(4) I, Robertson

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. May be taken independently of course 171A. Selected
readings from the Old Testament prophets and the New
Testament. Offered in odd-numbered years. General Educa-
tion credit: Civilization and Culture/Non-Introductory.
Recommended GE prerequisite: History 4A, 4B, 4C, Phi-
losophy 1, 10B, Religious Studies 21, 40, or any course
from the GE Literature Prerequisite List.

***173. The Literature of Science Fiction** (4)

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. Study of the literary modes and methods of science
fiction. The course will analyze representative novels and
short stories which exemplify major themes and styles in
this genre—e.g., time travel; alternative universes; utopian,
anthropological, sociological science fiction.

175. American Literary Humor (4) I.

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3, or standing above Freshman level. American humorous
vision of man, nature, and the supernatural. Includes one
or more of the following: colonial humor; southwestern and
New England humor; pre- and post-Civil War masters; local
colorists; journalistic gadflies; anti-provincialists; modernist
poets and prose writers; black humor.

***179. Multi-Ethnic Literature** (4)

Lecture-discussion—3 hours; papers. Prerequisite: course
1 or 3, or standing above Freshman level. Fiction, poetry,
and other writings by Americans of ethnic minority background
(Native, Black, Hispanic, Jewish, Italian, etc.) which reveal
their immigrant experience, cultural diversity, and contributions
to American literature.

180. Children's Literature (4) III, Wiggins

Lecture-discussion—3 hours; paper. Prerequisite: course 1
or 3. Historical backgrounds and development of types of
children's literature, folklore and oral tradition, levels of in-
terest, criticism and evaluation, illustration and bibliography.

181. Black Literature (4) I, Morris

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. A study of the writings of black Americans, including
Chesnutt and Dunbar in the nineteenth century, the writings
of the Harlem Renaissance in the twentieth century, and the
more important contemporary black writers, such as
Wright, Ellison, Baldwin, Hansberry and Jones.

***182. Literature of California** (4)

Lecture-discussion—3 hours; term paper. Prerequisite: course
1 or 3. California literature in the context of California's
social, political, and intellectual history. Reading of poetry,
fiction, and essays. Emphasis on nineteenth- and twentieth-
century naturalists, turn of the century novelists, the Beats,
and writers of the last two decades. Offered in odd-numbered

years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: English 3, Comparative Literature 1, 2, or 3.

183. Film as Narrative (4) I, Silvia

Lecture—2 hours; discussion—1 hour; film viewing—1½–2 hours. Prerequisite: course 1 or 3; Dramatic Art 15 or consent of instructor. A close study of modern cinema (1930-1960) as a storytelling medium. Emphasis on the work of American and British artists (Ford, Huston, Hitchcock, Welles).

184. Literature of the Wilderness (4) II, Robertson

Lecture-discussion—3 hours; term paper. Prerequisite: course 1 or 3. Study of the theme of wilderness primarily in American Literature, with some consideration of Biblical and European antecedents. Major attention given to Thoreau, Muir, London, Austin, Faulkner, Snyder, and Abbey. Offered in odd-numbered years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: English 3, History 17A, or 17B.

185. Literature by Women (4) III, Moran

Lecture-discussion—3 hours; term paper. Prerequisite: course 1 or 3. English language literature by women from Bradstreet and Behn to the Brontës, Eliot, Woolf, Plath, and Rich. The effects of social constraints upon women's art; the rise of feminism; new trends in literary criticism.

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. One major writer's artistic development with attention to 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: course 1 or 3. Internships in fields where students can practice their skills. A maximum of 4 units is allowed toward the major in English. May be repeated for credit for a total of 12 units. (P/NP grading only.)

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) II, Hopkins

Discussion—3 hours. The elements of bibliography with special attention to literature and discussion of the principal modes of literary investigation—critical, historical, textual, and others.

***201. Literary Criticism** (4) Torrance

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)

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) I, Osborn

Discussion—3 hours; written reports; individual conferences. The language of Anglo-Saxon England; readings in Old English prose and poetry.

206. Beowulf (4) II, 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)

Discussion—3 hours; term paper. Study of the phonology, morphology, syntax, and lexicon between 1100 and 1500 with investigation of the regional dialects; pertinent facts on both the internal and external linguistic history; intensive reading of texts.

***209. Present-Day English Linguistics** (4)

Discussion—3 hours; term paper. Theory and methods of structural linguistics and transformational grammar as applied to the analysis of English. Emphasis will be on recent linguistic techniques, particularly as these relate to the teaching of language, literature, and composition.

210. Readings in English and American Literature (4) I, Hays, Craft, II, _____

Discussion—3 hours. Prerequisite: upper division English course in area to be studied. Offered in multiple sections each quarter. Content varies according to speciality of instructor. Course designed for students preparing for their comprehensive examinations. May be repeated for credit.

***215. Arthurian Romance** (4)

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)

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, McGuinness, III, Van Laer

Seminar—3 hours; conferences with individual students—1 hour; research papers. Artistic development of one major writer and his intellectual and literary milieu. May be repeated for credit when a different writer is studied.

232. Problems in English Literature (4) II, Waddington

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) III, Robertson, Cohn

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.

235. Theory of Fiction (4) I, Hicks

Seminar—3 hours; preparation and evaluation of paper on a work of fiction. Theories of fiction as they relate to the professional writer's practice of the craft. Designed for students in the creative writing program.

***236. Poetics** (4)

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) III,

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.

***238. Special Topics in Literary Theory** (4)

Seminar—3 hours; term paper. Prerequisite: course 237 or the equivalent. Advanced topics in literary theory and criticism. Preparation and evaluation of research paper. May be repeated for credit when topic and/or reading list differs. Offered in even-numbered years.

***240. Medieval Literature** (4)

Seminar—3 hours; conference—1 hour. Studies of Medieval literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

242. Sixteenth-Century Literature (4) I, Levin
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)

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) I, Schleiner

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) II, Byrd

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)

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, 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)

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) II, Van Leer

Seminar—3 hours; conference—1 hour. Studies in Early American literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

258. American Literature: 1800 to the Civil War (4)

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, Zender

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) I,

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)

I, Williamson
Seminar—3 hours; conference—1 hour. Studies in modern British and American literature. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when a different topic is studied.

285. Literature by Women (4) II, Moran

Seminar—3 hours; conference—1 hour. Studies in literature by women and the theoretical approaches to literature by women. Course materials to be selected by the instructor. Preparation and evaluation of research papers. May be repeated for credit when topic and/or reading list differs.

290F. Seminar in Creative Writing of Fiction (4) I, Baker, II, Gilbert, III, Hicks

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, Williamson; II, McPherson; III, Snyder

Seminar—3 hours; 1 additional hour of writing. Prerequisite: consent of instructor; graduate standing, with preference given to those enrolled in master's program in Creative Writing. Writing of poetry. Evaluation of written materials and individual student conferences. May be repeated for credit.

298. Directed Group Study (1-5) I, II, III, The Staff (Chairperson in charge)

(S/U grading only.)

- 298C. Colloquium on Literary Scholarship** (1-4) I, II, III. The Staff (Chairperson in charge)
 Oral presentation and critique of research papers. (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) II. ———
 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, III. Stokes
 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.)

391. Oral English for ESL Students (3) I, II, III. The Staff (Schwabe in charge)
 Lecture—2 hours; laboratory—2 hours. Prerequisite: open only to non-native English-speaking students with priority enrollment to foreign student teaching assistants; completion of any required ESL courses or consent of instructor. Intensive work in oral English to increase fluency and accuracy plus use of appropriate discourse strategies in academic settings (i.e., seminar, discussion, laboratory). (S/U grading only.)

392. Teaching Internship in English (4) I, II, III. Stokes (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.)

393. Problems in Teaching College Composition (2) I, II, III. The Staff (Chairperson in charge)
 Discussion—2 hours. Prerequisite: open to graduate students teaching composition in a variety of University courses including English A, 1, 3, 5, 20, 102, and 103. Designed for the relatively experienced student teacher who would profit from developing skills in specific areas. (S/U grading only.)

401. Editing "California Quarterly" (2) I, II, III. McPherson, 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.)

- Sean S. Duffey, Ph.D., Professor
 Lester E. Ehler, Ph.D., Professor
 Norman E. Gary, Ph.D., Professor
 Jeffrey Granett, Ph.D., 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., Associate 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., Lecturer
 G. A. H. McClelland, Ph.D., Professor
 Donald L. McLean, Ph.D., Professor Emeritus
 Christine Y. S. Peng, Ph.D., Associate Professor
 Timothy Prout, Ph.D., Professor Emeritus
 (Entomology, Genetics)
 Richard E. Rice, Ph.D., Lecturer
 Francis M. Summers, Ph.D., Professor Emeritus
 Robbin W. Thorp, Ph.D., Professor
 Philip S. Ward, Ph.D., Associate Professor
 Robert K. Washino, Ph.D., Professor
 Loyd 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. 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 (Microbiology 102, Botany 114, 119, Plant Pathology 120, Veterinary Microbiology and Immunology 132)	4-5
Genetics (Genetics 100)	4
Ecology (Environmental Studies 100 or Zoology 125)	3-4
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	4-5
Depth Subject Matter	39-42
General entomology, Entomology 100, 100L	5
Structure and function, Entomology 101, 102	7
Systematics, Entomology 103	3
Ecology, Entomology 104	4
Entomology 109, or Entomology 105L-106 or 105-105L	4-7
Applied entomology, one course from Entomology 110, 115A, 115B, 153	4
Upper-division electives courses in entomology	12

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:	
(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	26-31
Total Units for the Major	180
Major Adviser. C.Y.S. Peng.	

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.

Entomology	UNITS 18-19
Entomology 100, 100L	5
At least two courses from Entomology 101, 102, 103, 104, 106	7-8
At least two additional upper division Entomology courses (except courses 192, 198, 199)	6
Agricultural Entomology	UNITS 19-21
Entomology 100, 100L, 110, 115A, 115B	17
Entomology 118 or 120	2-4

Apiculture	UNITS 18
Entomology 100, 100L, 119, 119L	10
Entomology 104 or 110	4
Additional courses recommended: Agronomy 120, Botany 102, Pomology 102.	

Insect Ecology	UNITS 20
Entomology 100, 100L, 104	9
Seven units from Entomology 103, 105, 106, 109	7
Zoology 149 or Environmental Studies 121	4

Medical-Veterinary Entomology	UNITS 18
Entomology 100, 100L, 104, 153, 156	16
At least two units from Entomology 155, 156L, Veterinary Microbiology 126, 126L, 128, 132	2

Nematology	UNITS 18-20
Nematology 100, 110; 100 and/or Veterinary Microbiology 132	10-15
Two or three courses from one of the following areas	5-8
(a) Plant Science: Microbiology 101, Botany 120, 121, Entomology 100, 115A, 115B, 153, 156, 156L, Soil Science 111, Zoology 112, 142.	
(b) Entomology: Microbiology 101, Botany 120, 121, one upper division Entomology course, Soil Science 100, 111, Zoology 112, 142.	

Minor Adviser. C.Y.S. Peng.

Graduate Study. The Department of Entomology offers a program of study and research leading to the M.S. and Ph.D. degrees. See the Graduate Division Section and the *Graduate Announcement* for further details.

Graduate Advisers. See *Class Schedule and Room Directory*.

Related Courses. See courses in Nematology.

Courses in Entomology

Lower Division Courses

10. Natural History of Insects (3) II.
 Lecture—3 hours. Designed for students not specializing in

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Entomology

(College of Agricultural and Environmental Sciences)

Jeffrey Granett, Ph.D., Chairperson of the Department

Department Office, 367 Briggs Hall (752-0475)

Faculty

- Oscar G. Bacon, Ph.D., Professor Emeritus
 Richard M. Bohart, Ph.D., Professor Emeritus
 James R. Carey, Ph.D., Associate Professor
 Hugh Dingle, Ph.D., Professor

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.

11. Insects and Human Affairs (3) II, III. McClelland

Lecture—2 hours; discussion—1 hour. Insects as benefactors, competitors and destroyers of human food and life. Social political and environmental consequences of insect control. Study of insects and their role in the development of scientific thought and concepts. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10.

99. **Special Study for Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Upper Division Courses

100. General Entomology (3) I, Thorp

Lecture—3 hours. Prerequisite: Biological Sciences 1. Biology, anatomy, physiology, development, classification, ecology and relation of insects to human welfare.

100L. General Entomology Laboratory (2) I, Thorp

Laboratory—6 hours. Prerequisite: course 100 (may be taken concurrently). Anatomy, development, population ecology, methods of collecting, classification and identification of insects of all orders and of major families.

101. Functional Insect Morphology (3) II. Peng

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100. Study of the basic external and internal structures, organs and tissues of insects, with emphasis on functional systems. Functional anatomy, histology and fine structures of important organs and tissues will be discussed.

102. Insect Physiology (4) III. Duffey, Hammock, Judson

Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 100 or course in invertebrate zoology. Explanation of physiological processes by which insects function in, and adapt to, their physical, chemical and biological environments. Introduction to experimental methods, research equipment and procedures. Critical evaluation of concepts and laboratory procedures.

103. Insect Systematics (3) III. Ward

Lecture—2 hours; discussion—1 hour. Prerequisite: introductory course in zoology or entomology. Principles and methods of systematics, with particular reference to insects. Emphasis on different theories of classification, and analysis of phylogenetic relationships.

104. Insect Ecology and Behavior (4) II. Karban, Dingle

Lecture—3 hours; laboratory—3 hours. Prerequisite: introductory course in ecology (Zoology 125, Environmental Studies 100, Botany 117). Principles of ecology and behavior with emphasis on insects. Mechanisms and evolutionary aspects of behaviors population dynamics and community organization are explored. Students are acquainted with scientific method of formulating and testing hypotheses about natural systems.

105. Insect Classification (1) II. Thorp, Grigarick, Ward

Lecture—1 hour. Prerequisite: course 100. Theories on the phylogenetic history of insects; classification at the level of families, orders, and ordinal groups. Offered in odd-numbered years.

105L. Insect Classification Laboratory (2) II. Thorp, Grigarick, Ward

Laboratory—6 hours. Prerequisite: course 100L. Classification and identification of insects with emphasis on family-level taxa. Offered in odd-numbered years.

106. Field Entomology (2) III. Thorp

Laboratory—6 hours; two all-day Saturday field trips. Prerequisite: course 100 and 105L. Collection and comparative analyses of insect faunas from selected ecological zones in California. Offered in odd-numbered years.

109. Field Taxonomy and Ecology (7) Extra-session summer. 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.

115A-115B. Arthropod Management in Agriculture (4-4) II-III. Wilson, Ehler, Kaya, Granett

Lecture—3 hours; laboratory—3 hours. Prerequisite: courses 100 or 110. Definition of pest status, measurement of pest damage, and interactions between pests and plants. Integration of tactics for ameliorating pest damage including

use of cultural methods, beneficial arthropods, pathogens, and chemicals. Examples will focus on California agriculture.

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 (2) III. Leigh

Lecture—2 hours; three field trips (optional). Prerequisite: course 110 and upper division standing; additional entomology, genetics and plant science courses recommended. Introduction to plant resistance as a component of pest management; methods used to identify mechanisms of plant resistance to pests and integration of resistance with other pest control practices as primary or supplemental management practices. 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

Lecture—1 hour; laboratory—3 hours. Prerequisite: course 119. Biology and behavior of honey bees; fundamentals of culture, management, and use of colonies for agricultural, recreational, teaching, and research purposes.

120. Insect-Host Plant Interactions (4) II. Duffey

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 101, 102; 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.

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), Maggenti (Nematology)

Lecture—3 hours. Prerequisite: Biological Sciences 1 or consent of instructors. Lectures on the biological and ecological aspects affecting host-parasite relationships using selected examples from protozoan and metazoan fauna.

156L. Biology of Parasitism Laboratory (1) III. Washino in charge; Theis (Medical Microbiology), 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.

192. Internship (1-12) I, II, III, extra session. The Staff (Chairperson in charge)

Laboratory or field—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

202. Advanced Insect Physiology (2) III. Judson

Lecture—2 hours. Prerequisite: course 102 or the equivalent or consent of instructor; Biochemistry 101A or 101B recommended. Selected topics of insect physiology. Intensive study of topics of current interest, which will vary from year to year. Course may be repeated for credit. Offered in odd-numbered years.

205. Insect Demography (3) III. Carey

Lecture—3 hours. Prerequisite: introductory ecology; calculus. Concepts and methods of mathematical demography as applied to insect populations; reasoning behind demographic calculations. Mechanisms of calculations stressed. (S/U grading only.)

208. Pesticide Toxicology in Arthropods (3) II. Granett, Hammock

Lecture—2 hours; discussion—1 hour. Prerequisite: course 115B or Environmental Toxicology 101 (may be taken concurrently); Biochemistry 101B. Principles of pesticide toxicology including resistance, selectivity, pharmacodynamics, sites of action and life tables. Emphasis on chemical and field aspects of insecticides and acaricides. Offered in odd-numbered years.

219. Advanced Apiculture (4) III. Peng

Lecture—2 hours; laboratory—6 hours. Prerequisite: course 119L. Current topics in bee biology with special consideration of morphology, caste determination, queen rearing, nutrition, physiology, pathology, and products of honey bees. Offered in even-numbered years.

225. Terrestrial Field Ecology (4) III. Karban

Seminar—1 hour; laboratory—12 hours. Prerequisite: introductory ecology and introductory statistics. Field course conducted over spring break and four weekends at Bodega Bay emphasizing student projects. Ecological hypothesis testing, data gathering, analysis, and written and oral presentation of results stressed.

227. Acarology (4) I, Ehler

Lecture—2 hours; laboratory—6 hours. Prerequisite: graduate or upper division standing in biological science. Systematics, morphology, physiology, ecology and evolution of mites; management of pest species discussed but not emphasized. Offered in even-numbered years.

230. Biological Control (3) I, Ehler

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 100, 104, and 115B, or consent of instructor. Advanced treatment of current topics in biological control of arthropod pests and weeds. Offered in odd-numbered years.

245. Pollination Ecology (4) II. 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 arthropod-borne human diseases with emphasis on the relationships of the biology of the vector to the ecology of the disease. Discussion includes demonstration of vectors and techniques. Offered in odd-numbered years.

290. Special Topics in Entomology (1-4) I, II, III. The Staff (Chairperson in charge)

Seminar—1-4 hours. Prerequisite: consent of instructor.

291. Seminar in Medical Entomology (2) I, McClelland, Washino

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, Duffey, Hammock

Seminar—2 hours. Prerequisite: course 102. Critical examination of areas of current interest to insect physiology and biochemistry.

293. Seminar in Systematic Entomology (2) III. Ward, Thorp

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. Grigarick, Granett, Leigh, 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

402. Basic Computer Techniques for Entomologists (2) II. McClelland
Lecture—1 hour; laboratory—2 hours. Prerequisite: graduate standing; a statistics course.† Data acquisition, transfer between systems, processing, analysis and graphical presentation. Report writing using word-processing software. Applications of database management and spreadsheet software. Programming in BASIC. Use of available microcomputers, UNIX, VAX and other appropriate systems.

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. Grantmanship (2) III, Granett, Duffey
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 115A recommended.† Theory and practice of insect bioassays as they are used in entomology, particularly with insecticides. Offered in odd-numbered years.

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 application of SEM to produce information emphasizing photographic images of publishable quality. Offered in odd-numbered years.

Environmental and Resource Sciences

See Atmospheric Science, Range and Wildlands Science, Resource Sciences, Soil Science, Water Science, and Wildlife and Fisheries Biology

Environmental Design

(College of Agricultural and Environmental Sciences)

Robert L. Thayer Jr., M.A., Chairperson of the Department

Department Office, 144 Walker Hall (752-6223)

Faculty

Richard Berteaux, B.Arch., M.S., Associate Professor

Frances Butler, M.A., Professor

Kerry J. Dawson, M.L.A., Associate Professor

Paul Deering, M.L.A., Lecturer

Mark Francis, M.L.A., Associate Professor

Dolph Gotelli, M.A., Associate Professor
Gyöngy Laky, M.A., Professor
Gregory Lynn, M.A., Lecturer
E. Byron McCulley, B.S.L.A., Lecturer
Edward S. McNeil, M.L.A., Assistant Professor
Helge B. Olsen, Senior Lecturer
Susan Palmer, M.A., Lecturer
Victoria Z. Rivers, M.A.C.T., S.C.T., Associate Professor

Warren G. Roberts, M.S., Lecturer
Katherine W. Rossbach, M.A., Professor Emeritus

Barbara Shawcroft, M.F.A., Professor
JoAnn C. Stabb, M.A., Senior Lecturer
Robert L. Thayer, Jr., M.A., Professor

Programs of Study. See the majors in Design and Landscape Architecture.

Related Courses. See Design and Landscape Architecture course lists.

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., Lecturer
William B. Davis, M.S., Professor Emeritus
Don J. Durzan, Ph.D., Professor
Richard Y. Evans, M.S., Lecturer
Seymour M. Gold, Ph.D., Professor
James A. Harding, Ph.D., Professor
Richard W. Harris, Ph.D., Professor Emeritus
Charles E. Hess, Ph.D., Professor
Anton M. Kofranek, Ph.D., Professor Emeritus
Harry C. Kohl, Jr., Ph.D., Professor Emeritus
Andrew T. Leiser, Ph.D., Professor
J. Heinrich Lieth, Ph.D., Assistant Professor
James D. MacDonald, Ph.D., Associate Professor (*Plant Pathology*)

John H. Madison, Jr., Ph.D., Professor Emeritus
Jack L. Paul, Ph.D., Professor
Michael S. Reid, Ph.D., Professor
Warren G. Roberts, M.S., 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, and Plant Science; and for graduate study, refer to the Graduate Division section.

Related Courses. See Plant Science.

Courses in Environmental Horticulture

Lower Division Courses

6. Introduction to Environmental Plants (3) III, summer. Harding.
Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: consent of instructor. Classification, nomenclature, and identification of common trees, shrubs, ground covers, turfgrasses, bedding plants, and house plants. Characteristics of important plant families. Designed for majors and non-majors.

10. Landscape Horticulture for the Home and Community (3) III, summer, the Staff
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 (4) III, Harding
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: introductory course in environmental plants (course 6) or in plant taxonomy (Botany 108). Evolutionary relationships, hybridization, selection and cultural uses of herbaceous, environmental plant materials with emphasis on family characteristics and genetic and environmental differences. Plants are identified with the use of taxonomic keys.

***115. Advanced Taxonomy and Ecology of Environmental Plants** (4) III, Leiser
Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 105 or consent of instructor. Identification, nomenclature and classification of plants for man's environment are studied in relation to extensive variations and ecological modification. Emphasis is placed on the use of plants in western climatic zones. Nomenclature codes are discussed. Offered in odd-numbered years.

120. Management of Container Soils (3) I, Paul
Lecture—2 hours; laboratory—3 hours. Prerequisite: Soil Science 100. Appropriate use of sand, mineral soil and amendments to formulate container soils. Management of container soils emphasizing irrigation, salinity control and fertilizer practices.

125. Greenhouse and Nursery Crop Production (5) II, Lieth, Burger
Lecture—3 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: Plant Science 2. Principles and techniques necessary for the greenhouse and nursery production of ornamental crops.

130. Turfgrass 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, Berry
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.

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. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: 3 units of upper division work in environmental horticulture; consent of instructor. (P/NP grading only.)

Graduate Courses

220. Biotechnology of Woody Perennials (2) II. Durzan Lecture—2 hours. Prerequisite: Bachelors or Masters degree in a plant science discipline (botany, plant physiology, genetics, horticulture, related fields). Develop understanding of basic principles of biotechnology of woody perennials. Cell and tissue culture methods and current process control problems are emphasized. Recombinant DNA methods covered where appropriate. Develop analytical evaluation skills. Review trends in commercialization.

226. Tissue Culture of Horticultural Crops (2) II. Burger Lecture—1 hour; laboratory—3 hours. Prerequisite: a B.S. degree (or the equivalent) in Plant Science or consent of instructor. In-depth analysis of tissue culture techniques used in horticulture for basic cellular physiology and biochemistry, propagation and breeding. Offered in even-numbered years.

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. Offered in odd-numbered years.

***251. Modeling Productivity of Greenhouse Flower Crops (3) II.** Lieth Lecture—2 hours; discussion—1 hour. Prerequisite: course 125; Plant Science 101. Course will introduce students to system modeling. 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. Discussion by Departmental faculty of design, philosophy and interpretation of ongoing specific research areas which include plant morphogenesis, floriculture, greenhouse production and modeling, landscape plant ecology, arboriculture, turf culture, post harvest, plant breeding, etc. S/U grading only.

290C. Research Group Conference (1) I, II, III. Reid, Sachs, Wu Discussion—1 hour. Prerequisite: students in a plant science graduate program. Research conference conducted by Departmental faculty to discuss design, philosophy and interpretation of ongoing specific research areas which includes plant morphogenesis, floriculture, greenhouse production, landscape plant ecology, arboriculture, turf culture, post harvest, and plant breeding related to environmental horticulture. (S/U grading only.)

297T. Tutoring in Environmental Horticulture (1-4) I, II, III. The Staff (Chairperson in charge) Tutoring—4 to 8 hours; discussion—1 hour. Prerequisite: graduate student standing; completion of course to be tutored (or the equivalent) or consent of instructor. Leading discussion sessions, conducting laboratory exercises and lecturing in Environmental Horticulture classes under faculty guidance. Weekly conference on subject matter and instructional techniques. May be repeated for credit by tutoring in different courses.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) Prerequisite: graduate standing. (S/U grading only.)

The curriculum draws on a wide variety of scientific disciplines for its theoretical bases and analytical skills. Chemistry, physics, mathematics, biology, and earth sciences are studied and are tied together by courses in ecology, Computing, statistics, and other methods courses give the student basic quantitative research skills. While the major emphasizes this fundamental program of education in the natural sciences, a small set of public policy analysis courses is required of all students so that they will understand the legal, economic, and political issues involved in park and natural areas management in the United States.

A moderate degree of specialization is permitted in three upper division options. In the *Environmental and Park Interpretation* option students are naturalists with communications skills interested in bringing to the public an appreciation of natural systems. Graduates will seek employment in a wide variety of public and private institutions concerned with environmental education, interpretation, and journalism. Students in the *Environmental Biology* option take course work in population ecology, physiology, biology, and quantitative analysis to prepare them for graduate or professional training and eventually for careers working for public agencies and private firms in environmentally sensitive industries. Students in the *Park Management* option take courses in urban park design, park administration, and recreation policy analysis, in addition to applied courses in park natural resource management. These students will seek jobs primarily in state and local park agencies.

Environmental Planning and Management

B.S. Major Requirements:

(The usual courses taken to satisfy requirements are shown in parentheses. Equal or more comprehensive courses may be taken with the adviser's written approval. *Courses shown without parentheses are required.*) Students will be required to plan their course selection with their adviser.

Preparatory Subject Matter	UNITS	46-51
Chemistry, Chemistry 1A-1B or 4A-4B	10	
Physics, Physics 6A-6B or 8A-8B	8	
Environmental sciences, Botany 2, Zoology 2, Geology 1-1L	3-5	
Biology, Biological Sciences 1	5	
Mathematics, Mathematics 16A-16B or 21A-21B	6-8	
Environmental analysis, Environmental Studies 1	4	
Policy analysis, Political Science 1 or Economics 1A	4-5	
(Choose Economics 1A if the Park Management option is selected.)		
Ecology of biomes, Environmental Studies 30	3	
Computing, Agricultural Science and Management 21, Computer Science Engineering 10, or Engineering 5,	3	
Depth Subject Matter	28-33	
(These units must be taken for a letter grade attaining an overall grade-point average of 2.000 or higher.)		
Ecology, Environmental Studies 100	4	
Survey of environmental science, Environmental Studies 110	4	
Environmental sciences (Soil Science 100, 118, Resource Sciences 131, Atmospheric Science 120, Environmental Studies 150A, Geology 134, 153, 154, 175, Water Science 100, 141)	6-8	
Environmental policymaking, Environmental Studies 160 or 161	4	
Resource economics, Agricultural Economics 147, 176, or Economics 123	3-4	
Statistics, Statistics 102 or Agricultural Science and Management 150	4	
Research methods (Environmental Studies 123, 128, 178, Mathematics 22A, upper division computing, mathematics, or statistics)	3-5	
(Students may substitute Biological Studies 115, 15 units, or Environmental Studies 124, 10 units.)		
Breadth Subject Matter	22-24	

English and rhetoric (English 1, and Rhetoric and Communication 1 or Dramatic Art 10; see also College requirement)	7-8
English composition, English 102 (concurrently with Environmental Studies 1), 103A, 103E, or 103G, 104	3-4
Humanities	12

Areas of Specialization

Environmental and Park Interpretation Option	
Environment and culture (Anthropology 3, 173, 174, Art 188B, Comparative Literature 20, Environmental Studies 101, History 85)	4
Leisure behavior, Environmental Planning and Management 116 or 127	4
Interpretation principles, Environmental Planning and Management 160A	3
Interpretation practices (Environmental Planning and Management 160B, Applied Behavioral Sciences 170, Wildlife and Fisheries Biology 191, Art 402, Dramatic Art 10, Agricultural and Home Economics Education 171, 172, Rhetoric and Communication 103, 114, 140, 142A, 142B, 151)	5-8
Animal biology (Wildlife and Fisheries Biology 111, 136 140, 151, Zoology 125, 136, 137, Environmental Studies 125, Entomology 104)	2-4
Plant biology (Botany 101, 102, 108, 117, 141, Resource Sciences 110, Range Science 100, 133, 134, Geography 173)	3-5
Aquatic ecosystems (Environmental Studies 116, 150C, 151, Water Science 122, Wildlife and Fisheries Biology 120)	3-4
Earth sciences (Geography 102, 108, Geology 153, 154, Soil Science 100, 118, Range Science 145)	5-8
Internship, Environmental Planning and Management 192	4
Fluency in a second language recommended.	

Environmental Biology Option	
Population and community ecology (Environmental Studies 121, Zoology 149, Wildlife and Fisheries Biology 122)	4
Behavioral ecology (Environmental Studies 125)	4
Evolution (Genetics 103, Geology 107, Zoology 148)	3-4
Quantitative analysis (Mathematics 22A-22B, upper division mathematics or statistics)	6-8
Taxonomy, including laboratory experience (Botany 102, 108, 116, Entomology 103, Wildlife and Fisheries Biology 110, 111, 111L, 120, Zoology 112-112L, 133, 133L)†	4-8
Physiology, including laboratory experience (Environmental Studies 129, 129L)†	4-7
Biological systems, two courses from one of the following two groups	6-8
<i>Aquatic biology:</i> Environmental Studies 151, 151L, Water Science 122, 122L, Environmental Studies 150B-150C, Wildlife and Fisheries Biology 120, 122.	
<i>Terrestrial ecology:</i> Wildlife and Fisheries Biology 100, 130, Avian Sciences 100, Botany 101, 102, 117, 141, Geography 173.	

Park Management Option	
Leisure behavior, Environmental Planning and Management 116 or 127	4
Microeconomics, Economics 100	5
Policy evaluation, Environmental Studies 168A	4
Bureaucratic policymaking, Environmental Planning and Management 122 or Environmental Studies 166	4
Organizational behavior (Political Science 181, 183, Psychology 183)	4
Environmental planning, Environmental Studies 162, 167, 171, 177, 179	3-4
Engineering planning (Civil Engineering 152, 160, 175)	3
Statistics, Sociology 106 or Statistics 103	4
Biological systems, two courses from one of the following three groups	6-8
<i>Plant biology:</i> Botany 101, 102, 117, 141, Geography 173, Range Science 145.	
<i>Animal biology:</i> Wildlife and Fisheries Biology 111, 136, 140, 151, Zoology 136, 137, Environmental Studies 125.	
<i>Aquatic biology:</i> Environmental Studies 116, 150C, 151, Water Science 122, Wildlife and Fisheries Biology 120.	

Unrestricted Electives

†Most of these courses require one or two additional chemistry or basic physiology courses as prerequisites. Plan a sequence in consultation with adviser.

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 prepares students to enter careers in park and natural areas management, interpretation, and research.

Total Units for the Major 180

Major Adviser: T. M. Powell (*Environmental Studies*).

Minor Program Requirements:

The faculty for Environmental Planning and Management offers a minor in Recreation for students in Landscape Architecture desiring to specialize in recreation area design; Physical Education, Psychology, Sociology, Human Development, and Applied Behavioral Sciences wishing to work in educational and therapeutic recreation; Environmental Policy Analysis and Planning seeking careers in public recreation policy analysis and management; Agricultural and Managerial Economics wishing to go into the administration of commercial recreation enterprises; and those in Plant Science interested in park landscape construction and maintenance.

UNITS

Recreation	21-23
Leisure behavior, Environmental Planning and Management 116 or 127	4
(Course 116 is prerequisite to Environmental Planning and Management 122 and 134.)	
Resource economics, Agricultural Economics 147, 176, Economics 123	3-4
Urban recreation programs, Physical Education 150	3
Recreation planning and policy analysis, Environmental Planning and Management 134 or Environmental Studies 162	4
Recreation administration, Environmental Planning and Management 122	4
Internship, Environmental Planning and Management 192	4

Minor Adviser: R. A. Johnston (*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.)

Upper Division Courses

110. Urban and Regional Planning (4) II. Gold (Environmental Horticulture) Lecture—3 hours; discussion—1 hour; one Saturday field trip. Prerequisite: upper division standing. The history, nature, scope and significance of planning in America with emphasis on basic definitions and concepts, the planning process and comprehensive plan, significant problems and potentials, design alternatives, the future, innovation and the profession.

*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.

127. Leisure Behavior (4) II. Loomis Lecture—2 hours; discussion—2 hours. Prerequisite: course 116; Applied Behavioral Sciences 170 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.

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.

160A. Environmental Interpretation Principles (3) II. The Staff Lecture—3 hours. Prerequisite: Rhetoric and Communication 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.)

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

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 provide students with a general background in the natural sciences relevant to environmental policy. It also provides sufficient training in mathematics, statistics, and research methodology to quantitatively analyze environmental problems and policy options. A strong background in policy analysis, including the evaluation of policy alternatives and the study of factors affecting policy formulation and implementation is included. In addition, students are encouraged to develop substantive knowledge in a specific field of environmental policy, such as urban and regional planning, water pollution control, or energy development.

The major will be attractive to students who want the analytical skills and broad background in the social and natural sciences for employment in public agencies, consulting firms, and businesses concerned with environmental affairs. It will also be appealing to preprofessional students who want to go on to graduate work in law, planning, public policy, or management, and who need both a wide background in the social and natural sciences and a fairly extensive background in a 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 adviser 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.)

Preparatory Subject Matter	UNITS 54-59
(These are minimum requirements. Additional courses may be necessary to meet prerequisites for upper division courses in some areas of specialization.)	
Mathematics 16A-16B or 21A-21B	6-8
Statistics 13, 32	3-4
Physics 1A	3
Chemistry 1A, 1B	10
Biological Sciences 1	5
Environmental science and agriculture (Soil Science 100; Water Science 100; Botany 2; Zoology 2; Geology 1; Plant Science 10; Animal Science 1; Water Science 104)	3-5
Political Science 1	4
Economics 1A, 1B	10
Engineering 5, Computer Science Engineering 10, 30, Agricultural Science and Management 21	3
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)	7
Courses fulfilling the General Education requirement are acceptable.	
Depth Subject Matter	37-40
(Students must take these units on a letter grade basis, and must attain an overall grade-point average of 2.000 or higher in the Depth Subject Matter courses.)	
Core Courses	
Environmental Studies 160	4
Environmental Studies 161, 173, or Water Science 150	3-4
Environmental Studies 166	4
Environmental Studies 168A	4
Environmental Studies 171 or 179	3-4
Environmental Studies 110	4
Research Methods	
Environmental Studies 177 or 178, or Sociology 103	4
Sociology 106 or Agricultural Economics 106 or Statistics 108	3-4
Economic Analysis	
Economics 100	5
Agricultural Economics 176	3
Areas of Specialization (choose one)	17-23
Advanced Policy Analysis Option	
Political institutions (Political Science 102, 105, 108, 159, Environmental Studies 162)	4
Political behavior (Political Science 164, 165, 170)	4
Science policy (Environmental Studies 165)	4
Policy evaluation research (Environmental Studies 168B)	4
Policy evaluation (Civil Engineering 153, 160, Agricultural Economics 155, Economics 125A, 125B, 130)	3-4

City and Regional Planning Option

Urban design (Art 168, Environmental Planning and Management 110; Landscape Architecture 40 recommended)	3-4
Urban geography (Geography 155, 156)	4
Transportation planning (Civil Engineering 160)	3
Environmental impact assessment (Soil Science 118, Environmental Studies 179)	3-4
Urban economics (Economics 125A or 125B)	4
Urban politics (Political Science 102, 100)	4
(Enroll for Environmental Studies 173 for law requirement under Depth Subject Matter above.)	

Energy Policy Option

Environmental health (Environmental Studies 126, Environmental Toxicology 101)	4
Nuclear hazards (Environmental Studies 115)	3
Energy technology (Engineering 160, 162)	4
Solar energy (Resource Sciences 103)	3
Economics of energy (Environmental Studies 169)	4
Energy policy (Environmental Studies 167)	4

Environmental Science Option

Environmental health (Environmental Studies 126, Environmental Toxicology 101)	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, Atmospheric Science 149A, 158, Civil Engineering 149A)	3-4
Science policy (Environmental Studies 165)	4

Recreation Policy Option

Leisure behavior (Environmental Planning and Management 127)	4
Survey research (Environmental Studies 177)	4
Urban recreation (Physical Education 150, Environmental Planning and Management 134)	4
Recreation policy analysis (Environmental Studies 162)	4
Recreation management (Environmental Planning and Management 122, Agricultural Economics 112)	4

Transportation Planning Option

Urban structure (Geography 155, 156, Economics 125A, 125B)	4
Transportation planning (Civil Engineering 160)	3
Transportation engineering and analysis (Civil Engineering 161, Environmental Studies 168B)	3-4
Energy policy (Environmental Studies 167, Engineering 160)	4
Air quality (Resource Sciences 131)	3
Energy and environmental aspects of transportation (Environmental Studies 163)	3

Water Quality Option

Water resource management (Environmental Studies 126, Environmental Toxicology 101, Geography 162)	4
Water pollution (Water Science 41, Soil Science 120)	2-3
Freshwater systems (Water Science 122, Environmental Studies 151)	3-4
Field and laboratory methods (Water Science 122L, Environmental Studies 151L)	2-3
Water chemistry (Water Science 103, 180)	3-4
Hydrology (Water Science 141)	3
(Enroll for Water Science 150 for law requirement under Depth Subject Matter above.)	

Unrestricted Electives	24-42
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.

Energy Policy	UNITS 16-18
Preparation: Economics 1A; basic course in political science.	
Resource Sciences 3 or Engineering 160	3-4
Environmental Studies 126 or Environmental Toxicology 101	4
Resource Sciences 103 or Environmental Studies 115	3
Environmental Studies 169	4
Environmental Studies 167 or Political Science 171	4

Environmental Policy Analysis	UNITS 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)

Charles R. Goldman, Ph.D., Chairperson of the Division

Division Office, 2132 Wickson Hall (752-3026)

Faculty

James J. Beaumont, M.D., Assistant Professor in Residence (*Internal Medicine*)
 Richard Cowen, Ph.D., Professor (*Geology*)
 Paul P. Craig, Ph.D., Professor (*Engineering: Applied Science*)
 William G. Davis, Ph.D., Associate Professor (*Anthropology*)
 Theodore C. Foin, Jr., Ph.D., Professor
 Charles R. Goldman, Ph.D., Professor
 Marvin Goldman, Ph.D., Professor (*Radiological Sciences*)
 Cary J. Goulard, Ph.D., Lecturer
 William J. Hamilton III, Ph.D., Professor
 Alan M. Hastings, Ph.D., Professor (*Environmental Studies, Mathematics*)
 Robert A. Johnston, M.S., Associate Professor
^{3,4}Jere H. Lipps, Ph.D., Professor (*Geology*)
 John B. Loomis, Ph.D., Assistant Professor (*Environmental Studies, Agricultural Economics*)
 Benjamin S. Orlove, Ph.D., Professor
 Mark R. Patterson, Ph.D., Assistant Professor
 Thomas M. Powell, Ph.D., 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 (*Zoology*)
 Christine Schonewald-Cox, Ph.D., Assistant Adjunct Professor
 Seymour I. Schwartz, Ph.D., Professor
 Daniel Sperling, Ph.D., Associate Professor (*Environmental Studies, Civil Engineering*)
 Thomas H. Suchanek, Ph.D., Lecturer
 Geoffrey A. Wandesforde-Smith, Ph.D., Associate Professor (*Environmental Studies, Political Science*)
 Kenneth E. F. Watt, Ph.D., LL.D., Professor (*Zoology*)
 James E. Wilen, Ph.D., 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 Bachelor of Science degrees in Environmental Planning and Management and in Environmental Policy Analysis and Planning. Courses in Environmental Studies also supplement major programs in a wide variety of established disciplines, although highly motivated undergraduates who find existing majors unsuited to their educational objectives are encouraged to contact the Chairperson and faculty of the Division regarding individual majors in the College of Agricultural and Environmental Sciences (see Individual Major in the Programs and Courses section).

Current Information. Through its continuing contacts with many other departments and teaching divisions on the campus, the Division develops each year a variety of special courses and workshops that cannot be listed here. Students are advised to check with the Division Office and with the expanded course description handbook of the College of Agricultural and Environmental Sciences for up-to-date information about courses.

Graduate Study. The faculty of the Division offers graduate instruction through the M.S. and Ph.D. degree programs of the Graduate Group in Ecology, as well as through the graduate programs of the disciplines with which they are associated, such as agricultural economics, zoology, sociology, political science, civil engineering, and anthropology. Further information about graduate programs in ecology should be obtained from the Chairperson of the Graduate Group in Ecology.

Graduate Adviser. 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: English 1; English 102, Economics 1A, 1B, Biological Sciences 1, and Political Science 1 recommended. Analysis of the biological, physical, and social interactions which constitute environmental problems, such as food production, energy development and conservation, pollution, and the conservation of natural environments. Emphasis on analysis of problems and the consequences of proposed solutions. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 1 or Economics 1A-1B.

10. Introduction to Environmental Studies (4) I. Wandesforde-Smith
 Lecture—3 hours; discussion—1 hour. Prerequisite: elementary biology recommended. Survey of the importance of ecology and systems behavior for man-environment relationships and management problems. Resources, environmental quality, urban dynamics, environmental perception, and conservation are covered. Includes several integrative case studies, and features individual reading in environmental problems. Not open for credit to those who have had course 1.

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. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10.

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: ele-

mentary biology (including botanical and zoological elements); elementary calculus. Ecological principles of biological systems, emphasizing populations and ecosystems. Principles of growth, regulation, distribution, structure, energetics, and mineral cycles related to the evolution of biological systems and applications to selected human ecological problems.

101. Human Ecology (4) II. Richerson

Lecture—3 hours; discussion—1 hour. Prerequisite: one course from course 30, Anthropology 1, 2, Genetics 10, or the equivalent. Critical variables in the processes that relate humans and their environment. Emphasis on the biological, cultural, social, and psychological forces which encourage stability or change in human ecological relationships. (Same course as Anthropology 101.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: a course from Environmental Studies 1, 30, Anthropology 1, 2, Biological Sciences 10, Geography 2, or Sociology 2.

(a) Environmental Science

110. Principles of Environmental Science (4) I, Powell

Lecture—3 hours; discussion—1 hour. Prerequisite: Physics 1A or 6A, 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—3 hours; field trip to nuclear power station. Prerequisite: a course in biology. Biospheric implications of radio-nuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on predictions of the most sensitive physiological response. Offered in odd-numbered years. (Same course as Radiological Sciences 115.)

116. The Oceans (3) II. Powell, Lipps

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.) General Education credit with concurrent enrollment in course 116D: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10, Chemistry 10, or Geology 1.

116D. The Oceans: Discussion (2) II. Powell, Lipps

Discussion—2 hours. Prerequisite: course 116/Geology 116 concurrently. Scientific method applied to the processes, biota and history of the oceans. Major scientific breakthroughs explored. (Same course as Geology 116G.) General Education credit with concurrent enrollment in course 116: Nature and Environment/Non-Introductory. Recommended GE prerequisite: see course 116 above.

(b) Ecological Analysis

121. Population Ecology (4) II. Hastings

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. Offered in odd-numbered years.

123. Introduction to Field and Laboratory Methods in Ecology (4) III. 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. Environmental and Occupational Epidemiology (4) III. Beaumont

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory course in statistics and upper division standing. Methods and contemporary issues in environmental and occupational epidemiology. Effects of carcinogens, reproductive hazards, lifestyle factors, air and water pollution, infectious agents, and other hazards on human populations. Discussion of epidemiologic study designs, biases, and risk assessment.

*127. Contemporary Problems in Environmental Health (3) III. The Staff

Lecture—2 hours; discussion—1 hour. Prerequisite: Environmental Studies 126 or consent of instructor. Contemporary problems and issues in environmentally dependent aspects of health. Diseases and injuries from environmental carcinogens, teratogens, pesticides, noise, radiation, consumer products, stress phenomena, and heavy metals are considered.

128. Analysis and Simulation of Complex Systems (3) I, Foin

Lecture—3 hours. Prerequisite: Mathematics 16B or 21B, Statistics 102, and upper division standing in the biological or social sciences. Analysis of systems and construction of simulation models of ecological and socioeconomic systems using DYNAMO; evaluation of models. Logical and scientific reasoning is stressed.

128L. Laboratory in Modeling Complex Systems (2) I, Foin

Laboratory—6 hours. Prerequisite: course 128 concurrently. Laboratory in model building. Students use material from course 128 to complete a number of exercises and small term projects. Simulation is in DYNAMO.

129. Physiological Ecology (4) I, Patterson

Lecture—3 hours; discussion—1 hour; laboratory—1 hour; independent student project or term paper. Prerequisite: Chemistry 1B, Physics 1B, and Zoology 2 or Botany 2. Comparative and evolutionary study of organismic responses and adaptations to the physical and chemical environment. Body size and metabolism, gas and nutrient exchange, thermoregulation, biomechanics, locomotion, and selected topics in current research.

129L. Physiological Ecology Laboratory (3) I, Patterson

Laboratory—6 hours; independent project, including written report and presentation. Prerequisite: course 129 (may be taken concurrently) or the equivalent. Methods for monitoring physical variables in aquatic and terrestrial environments and animal responses to them. Digestion, respiration and thermoregulation are demonstrated and a broadly comparative approach is considered.

(c) Cultural Ecology

133. Cultural Ecology (4) III. Ortove

Lecture—3 hours; discussion—1 hour. A comparative survey of the interaction between diverse human cultural systems and the environment. Primary emphasis is given to people in rural and relatively undeveloped environments as a basis for interpreting more complex environments. (Same course as Anthropology 133.) General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2.

(d) Aquatic Ecosystems Analysis

150A. Physical and Chemical Oceanography (4) III. Powell

Lecture—3 hours; discussion—1 hour. Prerequisite: Environmental Studies/Geology 116, Physics 6C, 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. Offered in odd-numbered years. (Same course as Geology 150A.) Offered in odd-numbered years.

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

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. Offered in even-numbered years. (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. Wandersforde-Smith

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing and one course in environmental science (course 1, 10, 110, Biological Sciences 1, Environmental Toxicology 10, or Resource Sciences 100); English 1 and Political Science 1 recommended. Introduction for non-Law School students to some of the principal issues in environmental law and the judicial interpretation of some important environmental statutes, e.g., NEPA. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 1.

162. Recreation Policy Analysis (4) III. Loomis

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; Agricultural Economics 147 or 176; Environmental Planning and Management 127. Introduction to major issues and evaluative techniques in the analysis of outdoor recreation policy. Principles of political science and economics are applied to the analysis of recreation demand and provision, and the resolution of conflicts between recreation and other uses.

163. Energy and Environmental Aspects of Transportation (3) III. Sperling

Lecture—3 hours. Prerequisite: Civil Engineering 160. Application of engineering, economic, and system planning concepts. Analysis of energy, air quality, and other selected environmental attributes of transportation technologies. Investigation of strategies for reducing pollution and petroleum consumption in light of institutional and political constraints. Offered in even-numbered years. (Same course as Civil Engineering 163.)

164. Ethical Issues in Environmental Policy (3) III. Sabatier

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 160, 168A recommended. Basic modes of ethical reasoning and criteria of distributive justice applied to selected topics in environmental policy-making.

165. Science, Experts and Public Policy (4) II. Craig

Lecture—4 hours. Prerequisite: upper division standing in the social or biological sciences; course 160 or Political Science 108 recommended. Analysis of factors affecting the influence of scientists, planners, and other experts in policy-making. Several cases and controversies will be examined. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 1.

166. Policy-Making in Natural Resource Agencies (4) II. Sabatier

Lecture—3 hours; discussion—1 hour. Prerequisite: Political Science 1 or course 160. Analysis of factors affecting decision-making within administrative agencies responsible for managing natural resources, such as the Forest Service and EPA. Emphasizes critical examination of written materials. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 1.

167. Energy Policy (4) III. Johnston

Lecture—4 hours. Prerequisite: Resource Sciences 3 or Engineering 160; course 160 or Political Science 101, 107, or 109. Overview of U.S. energy policy; policy analysis, philosophy and methods; major policy issues, such as renewable vs. nonrenewable; and applied studies of power plants, solar residential, and state policy options. Offered in odd-numbered years.

168A. Methods of Environmental Policy Evaluation (4) II. Schwartz

Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 13; Economics 100 (may be taken concurrently); Mathematics 16B or 21B and course 1 recommended. Evaluation of alternatives for solution of complex environmental problems; impact analysis, benefit-cost analysis, distributional analysis,

decision making under uncertainty, and multiobjective evaluation.

168B. Methods of Environmental Policy Analysis (4) III. Schwartz

Lecture—3 hours; discussion—1 hour. Prerequisite: course 168A. Continuation of course 168A, with emphasis on examination of the literature for applications of research and evaluation techniques to problems of transportation, air and water pollution, land use and energy policy. Students will apply the methods and concepts by means of a major project.

169. Economics of Energy (4) II. Wilen

Lecture—3 hours; discussion—1 hour. Prerequisite: Agricultural Economics 100B or the equivalent; introductory course in calculus recommended. 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. Offered in even-numbered years. (Same course as Agricultural Economics 169).

(f) Environmental Planning

171. Environmental Planning (4) I, Johnston

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1; a course in social science and a course in environmental science. Laws, institutions, design and analysis methods, and means of implementation of plans for land use, air and water quality, transportation, and energy are examined. Theoretical and practical readings are used. Political and technical problems common to all planning processes emphasized.

172. Public Lands Management (4) I, Loomis

Lecture—3 hours; discussion—1 hour. Prerequisite: Economics 1A. Investigation of alternative approaches to public lands management by Federal and state agencies. Role each agency's legislation plays in determining the range of resource allocations.

173. Public Mechanisms for Controlling Land Use (4) I, 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. Offered in odd-numbered years.

*177. Survey Research Methods (4) I, Loomis

Lecture—3 hours; discussion—1 hour. Prerequisite: Statistics 102, 103, or Sociology 46B. Survey design, administration, response coding, and data analysis. Emphasis on survey design and on uses in recreation policy analysis.

178. Applied Research Methods (4) I, Sperling, Loomis

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 Chair person 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. (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.)

228. Advanced Simulation Modeling (3) III. Foin

Lecture—2 hours; discussion—1 hour. Prerequisite: courses 128-128L; Statistics 108 or Agricultural Economics 106. Advanced techniques in simulation modeling; optimization and simulation, dynamic parameter estimation, linear models, error propagation, and sensitivity testing. Latter half of course will introduce model evaluation in ecological and social system models.

228L. Modeling Laboratory (3) III. Foin

Laboratory—2 hours; modeling and computing—7 hours. Prerequisite: courses 128-128L; course 228 concurrently. Continuation of course 128L. Students expected to complete series of exercises on advanced topics in modeling and a term project based on their graduate research.

298. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing. (S/U grading only.)

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, 4138 Food and Agricultural Sciences Building (752-1142)

Faculty

Thomas E. Archer, B.A., Lecturer
Richard G. Bureau, Ph.D., Professor
(*Environmental Toxicology, Soil Science*)

James L. Byard, Ph.D., Associate Adjunct Professor

Donald G. Crosby, Ph.D., Professor
Bruce D. Hammock, Ph.D., Professor

(*Environmental Toxicology, Entomology*)
Gary L. Henderson, Ph.D., Associate Professor

(*Environmental Toxicology, Pharmacology*)
Dennis P. H. Hsieh, Sc.D., Professor

Theodore L. Hullar, Ph.D., Professor
Wendell W. Kilgore, Ph.D., Professor

Marion G. Miller, Ph.D., Assistant Professor
Ming-yu Li, Ph.D., Lecturer

Fumio Matsumura, Ph.D., Professor
James N. Seiber, Ph.D., Professor

Takayuki Shibamoto, Ph.D., Professor
Wray W. Winterlin, M.S., Lecturer

Dorothy E. Woolley, Ph.D., Professor
(*Environmental Toxicology, Animal Physiology*)

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 may be substituted with adviser's approval. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	65-72
Biological sciences (Biological Sciences 1)	5
Other biological sciences (entomology, zoology, botany, microbiology, physiology)	10-12
General chemistry (Chemistry 1A-1B-1C and 5) ...	19
Organic chemistry (Chemistry 128A-128B-128C)	9
Environmental science (Environmental Toxicology 10 or Environmental Studies 10) ...	3-4
Mathematics (Mathematics 16A-16B or 21A-21B, and Statistics 13)	10-12
Computer Science (Agricultural Science and Management 21)	3
Physics (Physics 1A-1B or 6A-6B)	6-8
Depth Subject Matter	54
Biochemistry (Biochemistry 101A-101B)	6
Environmental Toxicology 101, 112A-112B, 114A-114B, 138 (128, 130A-E, 131, 132)	24
Electives selected for area of specialization with adviser's approval	24
Breadth Subject Matter	44
English and/or rhetoric (See College requirements)	7
Social sciences and humanities electives†	12
Electives selected with adviser's approval to complement program options: courses in agricultural economics, environmental studies, political science, psychology and sociology are particularly recommended	25
Unrestricted Electives	10-17
Total Units for the Major	180

Major Adviser. D.G. Crosby.

Advising Center for the major, is in 4111 Food and Agricultural Sciences Building (752-1042).

Minor Program Requirements:

	UNITS
Environmental Toxicology	19
Environmental Toxicology 101, 112A, 114A, 138 ...	13
Elective courses 6 units minimum, selected from Environmental Toxicology 128, 198 and 199 (4 units combined maximum), 10, 130A-E, 131, 132, 190	6

Minor Adviser. M.G. Miller.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Related Courses: See Resource Sciences 131, Environmental Studies 10, 121, 126, Wildlife and Fisheries Biology 153, Water Science 41.

Graduate Study. Programs of study leading to M.S. and Ph.D. degrees are available in the areas of Pharmacology and Toxicology, and Agricultural and Environmental Chemistry. For information on graduate study, contact the Advising Office or the appropriate graduate adviser. Refer also to the Graduate Division section in this catalog.

Graduate Advisers. B.W. Wilson (*Pharmacology and Toxicology*), T. Shibamoto and W.W. Winterlin (*Agricultural and Environmental Chemistry*).

Courses in Environmental Toxicology

Lower Division Courses

10. Introduction to Toxicology (3) III. Kilgore

Lecture—3 hours. Prerequisite: open to science and non-science majors. Study of some natural and man-made toxic substances in personal, occupational, community and global environments. Emphasis placed upon occurrence, properties and effects of toxic substances. Biological and physical factors which alter fate of substances are described.

92. Internship (1-12) I, II, III. The Staff (Chairperson in charge) 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 (4) I. The Staff (Chairperson in charge)

Lecture—4 hours. Prerequisite: Chemistry 8B or 128C (or the equivalent); Biochemistry 101A recommended. Principles governing the fate, consequences, and assessment of toxicants in environmental and biological systems; classes of environmental toxicants discussed include pesticides, air and water pollutants, phytotoxins, mycotoxins, food-borne toxicants, and heavy metals.

112A. Toxicants in the Environment (3) II. 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, Kilgore, Miller

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) III. 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, 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.

132. Chromatography for Analytical Toxicology (4) II. The Staff (Chairperson in charge)

Discussion—1 hour; laboratory—8 hours; slide demonstrations and extensive library assignments. Prerequisite: Chemistry 8B or the equivalent (may be taken concurrently); consent of instructor. Application and theory of basic chromatographic techniques such as thin-layer, gas-liquid, high-pressure liquid and column chromatography useful for analytical toxicology; residue analysis comprises one third of course.

138. Legal Aspects of Environmental Toxicology (3) II. 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

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 even-numbered years.

214. Mechanisms of Toxic Action (3) III. Hammock, Miller

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.

228. Gas Chromatography/Mass Spectrometry of Toxic Chemicals (3) I. Shibamoto

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: course 220 and Chemistry 219; or consent of instructor. Application of GC/MS techniques to investigate toxic chemicals. Mass spectral fragmentations and their ap-

plication to the structural elucidation. Practical application of GC/MS in current research. Offered odd-numbered years.

234. Neurophysiological Basis of Neurotoxicology (3) I. Woolley

Lecture—2½ hours; discussion—½ 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: graduate standing in Environmental Toxicology, a related major, or the equivalent experience, and consent of instructor. Teaching toxicology including conducting discussion groups for regular departmental courses under direct guidance of staff. May be repeated for credit up to a total of 5 units. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Epidemiology 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

JoAnne Bookman, M.S.L.S., Lecturer

Robert B. Bushnell, D.V.M., Lecturer

Tim E. Carpenter, Ph.D., Associate Professor

Thomas B. Farver, Ph.D., Associate Professor

Charles E. Franti, Ph.D., Professor

Ian A. Gardner, B.V.Sc., Ph.D., Assistant Professor

Constantin Genigeorgis, D.V.M., Ph.D., Professor

John S. Glenn, D.V.M., Ph.D., Lecturer

William Goodger, D.V.M., M.P.V.M., Ph.D., Assistant Professor

Lynette A. Hart, M.A., Ph.D., Assistant Adjunct Professor

David W. Hird, D.V.M., Ph.D., Associate Professor

Jack A. Howarth, D.V.M. Ph.D., Professor Emeritus

David A. Jessup, D.V.M., M.P.V.M., Lecturer

Carolyn S. Kopper, M.L.S., Lecturer

Kenneth M. Lam, Ph.D., Associate Professor

R. H. McCapes, D.V.M., Senior Lecturer

Margaret E. Meyer, Ph.D., Professor Emeritus

Ben B. Norman, D.V.M., Ph.D., Lecturer

Hans P. Riemann, D.V.M., Ph.D., Professor

Walter W. Sadler, D.V.M., M.P.H., Professor Emeritus

Calvin W. Schwabe, D.V.M., M.P.H., Sc.D., Professor

Patton L. Smith, D.V.M., M.P.V.M., Lecturer

Fredrick Stevens, D.V.M., M.S., Lecturer

H. Fred Trout, V.M.D., Ph.D., Professor

George B. E. West, D.V.M., M.P.V.M., Lecturer

Pleban W. Willeberg, D.V.Sc, Ph.D., Visiting Professor

Richard Yamamoto, Ph.D., Professor

George K. York, Ph.D., Lecturer

Part-Time Clinical Faculty

Galestan Ghazikhanian, D.V.M., Ph.D., Associate Clinical Professor
Richard A. McMillan, D.V.M., 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.

106. Human—Animal Interactions: Benefits and Issues (2) I, Hart
Lecture—2 hours. Prerequisite: Upper division standing or consent of instructor. The contributions of animals to human society, including historic, anthropologic, developmental, human health and therapeutic perspectives, as well as effects of humans on animals. Offered in even-numbered years.

111. Animal Hygiene (3) II. McCapes
Lecture—3 hours. Prerequisite: Biological Sciences 1 or consent of instructor. Causes, prevention, and control of animal diseases important in economic agriculture and in public health, with emphasis upon animal management factors in disease.

150. Food-borne Infections and Intoxications (4) II. Genigeorgis, York
Lecture—4 hours. Prerequisite: Microbiology 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.
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.

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. International Veterinary Medicine: 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 health are considered. Application of economic decision making techniques which may be used in veterinary medicine are also presented.

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.

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.

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.

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 non-parametric methods; introductory methods in regression and correlation; lifetables.

403. Medical Statistics II (3) II.

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.

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 403 or consent of instructor. Continuation of course 403. Multiple regression; discriminant analysis; analysis of cov-

ariance; 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.

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.

Lecture—1 hour; discussion—2 hours. Prerequisites: enrollment 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 (2-3) II-III. The Staff (Chairperson in charge)

Discussion—2 hours (409A); discussion—3 hours (409B). Prerequisite: course 406 (may be taken concurrently)† or consent of instructor. Emphasis on decision making with respect to the type and amount of data required for solving epidemiological problems and the selection and use of appropriate data in statistics and economics for processing, analyzing and interpreting these data. (Deferred grading only, pending completion of course.)

410A-410B. Topics in Applied Epidemiology (3-2) II-III. The Staff (Chairperson in charge)

Discussion—3 hours (410A); discussion—2 hours (410B). Prerequisite: course 406 (may be taken concurrently)† or consent of instructor. 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 concurrently).† Studies of various approaches to control or eradicate disease in animal populations. Design and economic analysis of control programs.

Family Practice

See Medicine, School of

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 and environmental 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	64-70
Biochemistry (Biochemistry 101A, 101B)	6
Biology (Biological Sciences 1)	5
Chemistry (Chemistry 1A-1B-1C, 5, and 8A-8B; or 4A-4B-4C and 128A-128B)	21-25
Mathematics (Mathematics 16A-16B or 21A-21B)	6-8
Statistics including analysis of variance (Agricultural Science and Management 150 or Statistics 106)	4
Microbiology (Microbiology 2, 3)	4
Physics (Physics 6A, 6B)	8
Computer science (Computer Science Engineering 10, 30, Agricultural Science and Management 21, or Engineering 5)	3
English (see College requirement)	7
Depth Subject Matter	40
Choose from: Viticulture and Enology 3, 123, 124, 125, 126, 127, 135, 140, 217, 219, 235; Food Science and Technology 102, 102L, 104 (or Epidemiology and Preventive Medicine 150), 104L, 108, 109, 110A, 110B, 150, 150L, 205, 206, 235, 250, 250L, Microbiology 105, 130A, 130B, 130L, 177, 250, Biochemistry 101L or 123-123L, Chemical Engineering 161, Chemistry 107A, 107B, 130, Epidemiology and Preventive Medicine 150 (or Food Science and Technology 104), Environmental Toxicology 128, Genetics 100. (No variable-unit 190, 192, 199, 290 courses allowed toward depth requirements). (Courses in depth subject matter may not be taken on the P/NP grading basis.)	
Restricted Electives	28
Selected according to student's educational goals and upon approval by adviser. Only 6 units of 192 or 6 units of 190, 199, or 298 may be counted; or a total of 8 units of these courses combined.	
Breadth Subject Matter	24
Social sciences and humanities or others as approved by adviser,† including General Education units (see General Education Requirement).	
Unrestricted Electives	18-24
Total Units for the Major	180

Major Adviser. R. E. Kunkee (*Viticulture and Enology*).

Graduate Study. Refer to the Graduate Division degree programs in Agricultural and Environmental Chemistry, Biochemistry, Chemical Engineering, Food Science, Genetics, Microbiology.

Fisheries

See Animal Science, and Wildlife and Fisheries/Biology

Food Biochemistry

(College of Agricultural and Environmental Sciences)

The Major Program

The major in Food Biochemistry stresses the principles of chemistry and biochemistry as related to constituents of foods and the changes which occur in the constituents before and during 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 in the life sciences.

B.S. Major Requirements:

(For convenience in program planning the *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	79-84
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 10, 30, Engineering 5, Mathematics 22A, 22B, 22C, Statistics 13, Agricultural Science and Management 150	12
Microbiology 2 or 102, and 3	4-5
Physics, any course except Physics 10 (Physics 6A-6B-6C or 8A-8B-8C)	12
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
(Courses taken in satisfaction of General education requirement are acceptable).	
Restricted Electives	24
At least one upper division biochemistry course, other than Biochemistry 101A, 101B, 101L, and one nutrition course other than Nutrition 10 (Nutrition 20, 101, 110), must be taken. The remaining units can be selected from biochemistry, physiology, environmental toxicology, genetics, public health,	

†Units earned in satisfaction of the American History and Institutions requirements may be used in partial satisfaction of the Social Sciences and Humanities requirements.

microbiology, or other subjects related to Food Science

Unrestricted Electives

20-25

Total Units for the Major 180

Major Adviser. M. Mazelis (*Food Science and Technology*).

Graduate Study. Refer to the Graduate Division section in this catalog.

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	61-65
Biology and microbiology (Biological Sciences 1, Microbiology 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 6A, 6B)	18
Written or oral expression (see College requirement)	7
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	29
Social sciences and humanities electives†	29
Restricted Electives	33-37
One course in nutrition; 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. D.S. Reid (*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 refer to the Graduate Division section.

Food Science (A Graduate Group)

Ericka L. Barrett, Ph.D., Chairperson of the Group

Group Office, 1480 Chemistry Annex (752-1415)

Faculty. Includes members from twelve departments in the Colleges of Agricultural and Environmental Sciences and Engineering, and the Schools of Medicine and Veterinary Medicine.

Graduate Study. The interdepartmental Graduate Group in Food Science offers programs of study leading to the M.S. degree 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 Annoucement*.

Graduate Advisers. Contact the Graduate Division for the list of advisers.

Food Science and Technology

(College of Agricultural and Environmental Sciences)

R. Larry Merson, Ph.D., Chairperson of the Department

Department Office, 126 Cruess Hall (752-1465)

Faculty

Everett Bandman, Ph.D., Associate Professor
Ericka L. Barrett, Ph.D., Professor
Richard A. Bernhard, Ph.D., Professor
A. Wade Brant, Ph.D., Lecturer
John Bruhn, Ph.D., Lecturer
Edwin B. Collins, Ph.D., Professor Emeritus
Walter L. Dunkley, Ph.D., Professor Emeritus
Robert E. Feeney, Ph.D., Professor Emeritus
J. Bruce German, Ph.D., Visiting Assistant Professor
Dieter W. Gruenwedel, Ph.D., Professor
Norman F. Haard, Ph.D., Professor
Jerald M. Henderson, D.Engr., Professor (*Food Science and Technology, Mechanical Engineering*)
Walter G. Jennings, Ph.D., Professor
Michael J. Lewis, Ph.D., Professor
Bor S. Luh, Ph.D., Professor Emeritus
George L. Marsh, M.S., Professor Emeritus
Mendel Mazelis, Ph.D., Professor
Michael J. McCarthy, Ph.D., Assistant Professor
R. Larry Merson, Ph.D., Professor (*Food Science and Technology, Agricultural Engineering*)
Martin W. Miller, Ph.D., Professor Emeritus
David M. Ogrzyziak, Ph.D., Associate Professor
Michael A. O'Mahony, Ph.D., Associate Professor
Rose Marie Pangborn, M.S., Professor
Herman J. Phaff, Ph.D., Professor Emeritus
Chester W. Price, Ph.D., Associate Professor
Robert J. Price, Ph.D., Lecturer
David S. Reid, Ph.D., Professor
Thomas Richardson, Ph.D., Professor (*Peter J. Shields Professor in Dairy Food Science*)
Gerald F. Russell, Ph.D., Professor
Barbara O. Schneeman, Ph.D., Professor (*Food Science and Technology, Internal Medicine, Nutrition*)
Bernard S. Schweigert, Ph.D., Professor

C.F. Shoemaker, Ph.D., Associate 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 Emeritus
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
Gideon Zeidler, D.Sc., Lecturer

Major Program and Graduate Study. See the major in Food Science; and for graduate study, refer to the Graduate Division section in this catalog.

Related Courses. See courses in Biochemistry and Biophysics, Consumer Science, Engineering, 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. 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.

2. Introductory Food Science (3) III. Lewis, O'Mahony, Schweigert

Lecture—3 hours. Nature of scientific method, the world food problem, food composition, nutritional and sensory aspects of food, food preservation, food safety, environmental consequences of food technology. Not open to students who have received credit for course 1, 100A, 100B, or 111. General Education credit: Nature and Environment/Introductory.

20. Food and Culture: An Introduction to Culture, Diet, and Cuisine (4) II. 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.

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.

Schweigert, Schneeman
Seminar—1 hour. Faculty and invited guest speakers will present topics in the area of nutrition and food science which are currently subjects of public debate. Intended as an introduction to nutrition and food science for students new to the campus. (P/NP grading only.) (Same course as Nutrition 93.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Merson in charge)
(P/NP grading only.)

Upper Division Courses

100A. Principles of Food Composition and Properties (3) I. Shoemaker
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. Russell, Schneeman
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. Mazelis
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 Science (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. Gruenwedel, G. Smith, Tappel
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. Barrett
Lecture—3 hours. Prerequisite: Microbiology 2, Biochemistry 101A. Microorganisms in food safety, spoilage, and production. Food-borne disease agents and their control. Growth parameters of food spoilage agents. Destruction of microbes in food. Food fermentations. The development of microbes as a resource for the food industry.

104L. Food Microbiology Laboratory (3) III. C. Price
Lecture—1 hour; laboratory—6 hours. Prerequisite: Microbiology 2 and 3; course 104. Cultural and morphological characteristics of microorganisms involved in food spoilage, in food-borne disease, and food fermentation. Analysis of microbiological quality of foods.

107. Principles of Sensory Analysis of Foods (4) II. 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. York
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 (3) III. Merson in charge
Lecture—2 hours; discussion—1 hour. Prerequisite: Statistics 13 or Agricultural Science and Management 150. Quality assurance measurement techniques applied to selected food processed products emphasized. Rationale for establishing valid quality assurance programs including selection of samples at critical points. Statistical problems in quality assurance programs used by the food industry.

110A. Physical Principles in Food Processing (3) I. Merson
Lecture—2 hours; laboratory—2 hours. Prerequisite: Physics 6A and 6B 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. McCarthy
Lecture—3 hours. Prerequisite: course 110A or the equivalent; Agricultural Engineering 110L recommended (may be taken concurrently). Rate processes: conduction, convection, and radiation heat transfer; microwave heating, refrigeration, freezing, psychrometrics; mass transfer during drying, and storage.

111. Introduction to Food Processing (4) II. Miller, Singh
Lecture—3 hours; discussion—demonstration—2 hours. Prerequisite: Microbiology 2, Chemistry 8A-8B, and Physics 6A-6B, 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 mech-

anims of human sensory systems. Problems of sensory measurement and their relation to food flavor.

119. Chemistry and Technology of Milk and Dairy Products (4) III. Richardson, G. Smith

Lecture—4 hours; demonstrations and a field trip. Prerequisite: Microbiology 2, Biochemistry 101A, or consent of instructor. Composition, structure and properties of milk and products derived from milk. Relates chemical, microbiological and technological principles to commercial practices in processing of milk and its products.

120. Principles of Meat Science (3) III. Bandman, Lee (Animal Science)

Lecture—3 hours. Prerequisite: 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. Principles of Poultry Product Technology (3) I, King (Avian Sciences)

Lecture—3 hours; demonstrations. Prerequisite: Biochemistry 101B (may be taken concurrently). Quality, preservation, and processing of avian products. Topics include quality control, nutrition, chemistry, biochemistry, microbiology, and functional properties.

122. Marine Food Science (3) II. Ogrzydzak, Haard

Lecture—3 hours. Prerequisite: Microbiology 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. Offered in even-numbered years.

125. Corrosion Principles in Food Processing Interactions (3) II. Gruenwedel

Lecture—3 hours. Prerequisite: Mathematics 16B; Physics 6C; 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.)

131. Packaging Processed Foods (3) III. Singh, Henderson, Zeidler

Lecture—3 hours. Prerequisite: course 1 or 111, Chemistry 8B, Microbiology 2 and Physics 6B, 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), Schweigert

Lecture—3 hours. Prerequisite: upper division standing. Legal and scientific issues involved in the regulation of the nation's food supply and nutritional status. Philosophy underpinning the application of regulatory statutes. Sources of information necessary for communication with government on public food policy information.

150. Thermal Processing of Foods (3) III. Merson

Lecture—2 hours; discussion, demonstration, and problem workshops—2 hours. Prerequisite: courses 104 and 110B or the equivalent. Theory and practical considerations of thermal processes by canning, pasteurization, and aseptic processing. Process calculations of microbial inactivation and chemical changes to safeguard public health, nutrition, and consumer acceptance. Description and engineering analysis of thermal processing equipment.

150L. Thermal Processing Laboratory (2) III. Merson

Laboratory—6 hours. Prerequisite: courses 104 and 110B; course 150 (may be taken concurrently). Laboratory exercises and student participation in the use and application of thermal processing methods and related procedures, and the interpretation of results, including evaluation of can closures, operation of thermal processing equipment, and the development and testing of sterilization processes.

151. Freezing Preservation of Food (3) II. Reid

Lecture—3 hours. Prerequisite: course 110B, Microbiology 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. Offered in odd-numbered years.

156. Computer Interfacing for Laboratory and Process Control (4) II. Shoemaker, Russell

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.

157. Food Process Design (2) III. McCarthy

Lecture—2 hours. Prerequisite: course 110B. Integration of engineering and economic principles applied to food process design. Specific areas covered include sanitation considerations, product quality, pollution control, equipment selection and safety. Offered in even-numbered years.

190. Senior Seminar (1) I, Reid, German

Seminar—1 hour. Prerequisite: senior standing or consent of instructor. Selected topics presented by students on recent advances in food science and technology. Reports and discussions concerning oral and written presentations, literature sources and career opportunities.

192. Internship for Advanced Undergraduates (1-12) I, II, III.

The Staff (Merson 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 (Merson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III.

The Staff (Merson in charge)
(P/NP grading only.)

Graduate Courses

201. Food Chemistry and Biochemistry (3) I, Tappel, Bernhard, Gruenwedel

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. Research proposals and group problem solving.

202. Chemical and Physical Changes in Food (3) II. Reid, Haard

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, Ogrzydzak

Lecture—3 hours. Prerequisite: Biochemistry 101A-101B and Microbiology 2; Microbiology 130A-130B or Genetics 102 recommended. Use of microorganisms for producing substances such as amino acids, peptides, enzymes, antibiotics and organic acids. Emphasis on metabolic regulation of pathways leading to fermentation products, on yeast fermentations, and on genetic manipulations (including recombinant DNA techniques) of industrial microorganisms. Offered in even-numbered years.

206. Biochemical Engineering (3) II. Ryu (Viticulture and Enology, Chemical Engineering)

Lecture—3 hours. Prerequisite: Microbiology 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. Pangborn, Noble (Viticulture and Enology)

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 107 and consent of instructor. Basic principles of measurement of color, texture, and flavor of foods by sensory and instrumental methods. Advanced statistical analysis of relation of colorimetry, texturometry and chemistry of volatile compounds to perception of appearance, texture, flavor. Offered in even-numbered years.

210. Proteins: Functional Activities and Interactions (3) II. Richardson

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. German

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) II. 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. Chromatographic and Electrophoretic Methods (4) II. G. Smith, Bandman, Jennings

Lecture—3 hours; discussion—1 hour. Prerequisite: Chemistry 1A-1B-1C, 8A-8B, 107A-107B and Biochemistry 101A-101B or consent of instructor. Theory and practice of gas and liquid chromatography and electrophoresis for analytical and preparative applications. Choice and optimization of separation methods, detection systems and recovery of purified sample components.

250L. Chromatographic and Electrophoretic Methods Laboratory (1) II. G. Smith, Bandman, Jennings

Laboratory—3 hours. Prerequisite: course 250 concurrently. Practice of gas and liquid chromatography and electrophoresis for analytical and preparative applications. Choice and optimization of separation methods, detection systems and recovery of purified sample components.

256. Computer Applications in Laboratory and Process Control (3) III. Shoemaker, Russell

Lecture—1 hour; laboratory—6 hours. Prerequisite: course 156 or the equivalent. Theory and practice of microcomputer interfacing to laboratory instrumentation for analytical and process control applications. Study of methods common to modern instrumentation and control systems including: A/D and D/A conversions, transducers, signal conditioning, and data transmission.

290. Seminar (1) I, II. Lewis

Seminar—1 hour. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. The Staff (Merson 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. Lewis

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 (Merson in charge)

299. Research (1-12) I, II, III. The Staff (Merson in charge)
Prerequisite: graduate standing. (S/U grading only.)

Food Service Management

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Nutrition.

The Major Program and Graduate Study

Food Service Management is incorporated within the major in Dietetics. If you are interested in preparing for a career in commercial organizations such as hotels, restaurants, industrial cafeterias, or contract food services, as well as in public or private institutions such as hospitals, correctional institutions, schools, or colleges, consult the Department of Nutrition regarding the Management specialization listed under the Unrestricted Electives of the Dietetics major.

Related Courses. See Food Science and Technology, and Nutrition.

Courses in Food Service Management

Questions pertaining to the following courses should be directed to the instructor or to the Nutrition Department Advising Office, 1151, Food and Agricultural Sciences Building (752-2512).

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. Institutional Food Purchasing and Sanitation (3) I, Schneeman Lecture—1 hour; discussion—2 hours. Prerequisite: Microbiology 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 (Schneeman 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 (Schneeman in charge) Internship—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.)

197. Tutoring in Food Service Management (1-2) I, II, III. The Staff (Prophet in charge) Discussion-laboratory—3 or 6 hours. Prerequisite: Dietetics or related major; completion of the Food Service Management course in which tutoring is done. Tutoring of students in food service management, assistance with discussion groups or laboratory sections; weekly conference with instructor in charge of course; written evaluations. May be repeated if tutoring a different course. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Prophet in charge) (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Prophet in charge)

Foreign Literature in Translation

See Literature in Translation

French

(College of Letters and Science)

*Manfred Kusch, Ph.D., Chairperson of the Department

Department Office (French and Italian), 516 Sprout Hall (752-0830)

Faculty

Claude Abraham, Ph.D., Professor
Max Bach, Ph.D., Professor Emeritus
Marc E. Blanchard, Agrégé de Lettres, Professor
Edward M. Bloembergen, Ph.D., Associate Professor

³Ruby Cohn, Ph.D., Professor (*Comparative Literature, Dramatic Art*)
Michele Hannoosh, Ph.D., Assistant Professor (*French, Comparative Literature*)
Gerald Herman, Ph.D., Lecturer
Margo R. Kaufman, M.A., Senior Lecturer
Manfred Kusch, Ph.D., Associate Professor (*French, Comparative Literature*)
Marie-Paule Laden, Ph.D., Visiting Associate Professor
Marshall Lindsay, Ph.D., Professor Emeritus
Maria I. Manea-Manoliu, Ph.D., Professor
³Michèle Praeger, Ph.D., Assistant Professor
Ruth B. York, Ph.D., Senior Lecturer

The Program of Study

The Program offers courses in language, literature, and civilization (in French), most of which may be taken in satisfaction of the Humanities Area Requirement of the College of Letters and Science. It also offers courses in literature (in translation) that have been approved as part of the Culture and Civilization component of the General Education requirement.

A major or minor in French is excellent preparation for those contemplating careers in government, business, teaching, or the professions. In addition, the solid training it provides in the language skills *per se*, as well as in the broader humanistic disciplines of critical thought, clear expression, and comprehension of the ideological, moral, and artistic values of a different culture, enables persons to play a more enriched and enlightened role in the internationally oriented modern world.

The facilities and activities supporting the Program are several: use is made of the language laboratory, of audio-visual aids, and the research library is excellent. There is an active French Club and the Department sponsors a chapter of Pi Delta Phi, the National French Honor Society. Ties with several campuses in France are maintained through the Education Abroad program. Each year, a prominent international writer/artist/scholar is in residence during one quarter.

The Major and Minor Programs

The major program is a balanced one, designed to assure proficiency in all four of the language skills—speaking, understanding, reading, and writing—and to acquaint students with the intellectual and cultural contributions of the French-speaking world through study of its literature and institutions.

French

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	18-38
French 1, 2, 3, 4 (or the equivalent)	0-20
French 6, 30A, 30B, 59	14
Linguistics 1	4
French 45 recommended.	

Depth Subject Matter	44
French 100	4
French 101, 102, 103	12
French 104	4
French 160	4
Two additional upper division French literature courses	8
Elective courses in French literature, language, or civilization to be chosen in consultation with undergraduate adviser	12
Total Units for the Major	64

Recommended

French 101, 102, 103, 104, 107, 135, and 160 plus other upper division courses for a total of 45 units for students interested in obtaining a "single subject" teaching credential in California.

Major Adviser. G. Herman.

Minor Program Requirements:

	UNITS
French	24
French 100	4
French 101, 102, 103	12
Two elective courses in French language, literature, or civilization to be chosen in consultation with undergraduate adviser	8

Prerequisite Credit. Credit will not normally be given for a course if it is the prerequisite of a course already successfully completed. Exceptions can be made by the Department Chairperson only.

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 for the M.A. are: a minimum residence of three quarters, 36 quarter units, and a passing score in the comprehensive 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. Maria I. Manea-Manoliu (M.A. degree); M. E. Blanchard (Ph.D. degree).

Teaching Credential Subject Representative. M. R. Kaufman. See also under the Teacher Education Program.

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 (5) 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 (5) I, II, III. The Staff Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 1. Continuation of course 1.

3. Elementary French (5) I, II, III. The Staff Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Continuation of course 2.

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.

8. French Conversation (2) I, II, III. The Staff
Discussion—2 hours; laboratory—1 hour. Prerequisite: course 3. Practice in speaking French; weekly quizzes and an oral and written final examination. Not open to native speakers.

25. Introduction to French Literature in Translation (3) II. The Staff
Discussion—3 hours. Introductory study of outstanding works of French drama and prose. Topics include major authors, genres, literary periods/movements. Study of literary techniques, structure, and meaning to foster better understanding of creative processes in French cultural context. Intended for the nonmajor. General Education credit: Civilization and Culture/Introductory.

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.

38. Intermediate French Conversation (2) I, II, III. The Staff
Discussion—2 hours; laboratory—1 hour. Prerequisite: course 6 or consent of instructor. Practice in speaking French; weekly quizzes and an oral and written final examination. Not open to native speakers or to upper division students.

45. Introduction to French Literature (4) I. 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, III. The Staff (Manea-Manoliu in charge)
Lecture—1 hour; laboratory—2 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
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. Composition in French (4) I, II, III. The Staff
Lecture—3 hours; several longer essays. Prerequisite: course 30B or consent of instructor. Instruction and practice in expository writing in French, with emphasis on organization, correct syntax, and vocabulary-building.

101. Introduction to French Poetry (4) II, III. Abraham, Blanchard
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of works representing the main types of French poetry. Study of French poetic conventions and versification.

102. Introduction to French Drama (4) I, III. Abraham, York
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of plays representing the main types of French drama, with emphasis on dramatic structure and techniques.

103. Introduction to French Prose (4) I, II. Laden, Kusch
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 100 or consent of instructor. Analysis and evaluation of works representing main types of French prose, with emphasis on narrative structure and techniques.

104. Translation (4) I, II. The Staff
Lecture—3 hours; short translations—30 hours minimum. Prerequisite: course 100 or consent of instructor. Practice in translation into French using a variety of texts illustrating different problems and styles.

106. French in Business and the Professions (4) I, Herman
Lecture—1 hour; discussion—2 hours; frequent written assignments. Prerequisite: course 100 or consent of instructor. The French language as used in the commercial sphere. Emphasis on proper style and form in letter-writing, and in non-literary composition. Technical terminology in such diverse fields as government and world business.

107. Contemporary France (4) III. Praeger
Lecture—3 hours; term paper—30 hours minimum. Prerequisite: course 100 or consent of instructor. Introduction to aspects of French culture and institutions of the contemporary period such as art, architecture, music, literature. Provides a background in French contemporary history, sociology and institutions.

108. Advanced French Conversation (2) I, III. The Staff
Discussion—3 hours. Prerequisite: course 30B or consent of instructor. Advanced 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.

110. Stylistics and Creative Composition (4) II. Herman
Lecture—3 hours; frequent papers—30 hours minimum. Prerequisite: course 100 or consent of instructor. Intensive course in creative composition using a variety of techniques and literary styles, patterned on Queneau's *Exercices de style*. Practice in such stylistic modifications as inversion, antithesis, changes in tense, mood, tonality, etc. The writing of poetry.

112. Masterpieces of French Drama in Translation (3) II. York
Discussion—3 hours. Prerequisite: course 25 or consent of instructor. Plays in translation representing the main types of French drama with emphasis on dramatic structure and techniques. Consideration of this genre within French social and cultural content. Intended for the nonmajor. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: French 25.

113. Masterpieces of French Novel in Translation (3) III. Blanchard
Discussion—3 hours. Prerequisite: course 25 or consent of instructor. Novels in translation representing works from the seventeenth century to the present. Study of broad generic, theoretical and historical contexts in France. Analysis of structure and techniques of the genre. Intended for the nonmajor. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: French 25.

114. French Philosophical Literature in Translation (3) III. Blanchard
Discussion—3 hours. Prerequisite: course 25 or consent of instructor. French philosophical literature, with works analyzed within broad philosophic, moral, and historical contexts. Focus on such topics as stoicism, classicism, libertinism, naturalism, existentialism, absurdism. Literary techniques and styles analyzed. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: French 25.

***115. Medieval Literature: Epic and Romance** (4) I, Herman
Lecture—3 hours; term paper. Prerequisite: course 100, 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) III. Blanchard
Lecture—3 hours; term paper. Prerequisite: courses 100 and 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: courses 100 and 102 or consent of instructor. Study of plays of Racine and Corneille. Offered in even-numbered years.

117B. Classical Comedy (4) I, Abraham
Lecture—3 hours; term paper. Prerequisite: courses 100 and 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 Moralists** (4) II. Bloomberg
Lecture—3 hours; term paper. Prerequisite: courses 100 and 103 or consent of instructor. Study of works of such moralists as Pascal, La Rochefoucauld, La Bruyère, Descartes, the Chevalier de Méré, and Boileau. Offered in even-numbered years.

118A. Les Philosophes (4) II. The Staff
Lecture—3 hours; term paper. Prerequisite: courses 100 and 103 or consent of instructor. Readings from Montesquieu, Voltaire, Diderot, Rousseau and the Encyclopédie. Offered in odd-numbered years.

***118B. The Novel in the Eighteenth Century** (4) II. Kusch
Lecture—3 hours; term paper. Prerequisite: courses 100 and 103 or consent of instructor. Novels of Lesage, Prévost, Diderot, Rousseau, Laclos, Sade. Offered in even-numbered years.

119A. The Nineteenth Century (4) II. Hannoosh
Lecture—3 hours; term paper. Prerequisite: courses 100 and 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. Hannoosh
Lecture—3 hours; term paper. Prerequisite: courses 100 and 103 or consent of instructor. Realism and Naturalism: Balzac, Flaubert, Maupassant, Zola.

***119C. Nineteenth-Century Poetry** (4) II. Hannoosh
Lecture—3 hours; term paper. Prerequisite: courses 100

and 101 or consent of instructor. Poetry from the Pre-Romantics to Baudelaire. Offered in even-numbered years.

120A. Twentieth-Century Drama (4) I, York
Lecture—3 hours; term paper. Prerequisite: courses 100 and 102 or consent of instructor. Representative plays from Jarry to Giraudoux. Offered in even-numbered years.

120B. Twentieth-Century Drama (4) III. York
Lecture—3 hours; term paper. Prerequisite: courses 100 and 102 or consent of instructor. Representative plays from Anouilh to Arrabal. Offered in odd-numbered years.

***121. Twentieth-Century Novel** (4) I, Blanchard
Lecture—3 hours; term paper. Prerequisite: courses 100 and 103 or consent of instructor. *Soties*, *révélés* and novel of André Gide and novels of Marcel Proust. Offered in even-numbered years.

***122. Twentieth-Century Novel** (4) I. Praeger
Lecture—3 hours; term paper. Prerequisite: courses 100 and 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) II. The Staff
Lecture—3 hours; term paper. Prerequisite: courses 100 and 101 or consent of instructor. Selected poetic texts from Apollinaire to the present, including such poets as Saint-John Perse, Bréton, Aragon, Reverdy, Eluard, Desnos, Ponge, Char, Michaux, Bonnefoy. Offered in even-numbered years.

***135. Advanced Composition** (4) III. Praeger
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 100 or consent of instructor. Practice in advanced composition, using the French *dissertation* as model, with occasional *explications de texte*.

138. Advanced Literary Translation (4) II. Bloomberg
Lecture—3 hours; term paper. Prerequisite: courses 100 and 104 or consent of instructor. Morphological, syntactical, and stylistic aspects of English-French translation.

***140. Study of a Major Writer** (4) II. The Staff (Chairperson in charge)
Lecture—3 hours; term paper—30 hours minimum. Prerequisite: course 100 and course 101 or 102 or 103 as appropriate to selected topic, or consent of instructor. Concentrated study of works of a single author. May be repeated once for credit as author-subject changes. 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: courses 100 and 101 or 102 or 103 as appropriate to the selected topic or consent of instructor. Subjects and themes such as satiric and didactic poetry of the Middle Ages, poetry of the Pléiade, theater in the eighteenth century, pre-romantic poetry, etc. May be repeated once for credit in a different subject area. Offered in odd-numbered years.

***150. Masterpieces of French Literature in Translation** (3) III. Blanchard
Discussion—3 hours; short papers. Prerequisite: course 25 and either course 112, 113, or 114, or consent of instructor. Selected masterpieces of French literature. Works to be analyzed in broad generic, philosophical, and historical contexts. Emphasis also on literary techniques.

***159. French Phonetics** (3) I, Manea-Manoliu
Lecture—3 hours. Prerequisite: course 59 or consent of instructor. 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, Manea-Manoliu
Lecture—3 hours; short papers—30 hours. Prerequisite: course 30B; Linguistics 1. Analysis of content and functions of the main grammatical categories of French in framework of recent structural approaches. Offered in even-numbered years.

161. Modern French Syntax (4) III. Manea-Manoliu
Lecture—3 hours; short papers—30 hours minimum. Prerequisite: course 160. Presentation of basic concepts of contemporary approaches to French syntax. Consideration of new explanations of so-called "irregular" phenomena in current language models. Offered in even-numbered years.

***162. History of French Language** (4) II. Manea-Manoliu
Lecture—3 hours; term paper. Prerequisite: course 160. Main periods in development of the French language, from Latin to contemporary popular aspects, with emphasis on relationship between socio-cultural patterns and evolution of the language. 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 vol-

untary discussion groups affiliated with departmental courses. May be repeated for credit for a total of 6 units. (P/NP grading only.)

*1977C. **Tutoring in the Community** (2-4) I, II, III. Kaufman Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing and consent of Chairperson. Tutoring in public schools under the guidance of a regular teacher and supervision by a departmental faculty member. May be repeated for credit for a total of 6 units. (P/NP grading only.)

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

199. **Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Chairperson in charge) (P/NP grading only.)

Graduate Courses

200. **Literary Analysis** (2) I. Blanchard Proseminar—1½ hours; short papers. Prerequisite: graduate standing. Required of all graduate students in French, this proseminar is designed to acquaint students with basic principles of applied literary theory.

201. **History of French: Phonology and Morphosyntax** (4) III. Manea-Manoliu Seminar—3 hours; term paper. Prerequisite: courses 159, 160, 250A, or consent of instructor. Presentation of the main changes in the phonemic 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 is studied.

*202B. **Medieval French Literature: The Romance Tradition** (4) I. 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.

206A. **Seventeenth-Century Literature: Theater** (4) II. Abraham Seminar—3 hours. Works of Corneille, Racine, Molière, and minor dramatists. One or more authors may be covered. May be repeated for credit with consent of instructor when different topics are studied.

*206B. **Seventeenth-Century Literature: Prose** (4) I. The Staff Seminar—3 hours; term paper and/or exposé. Works of authors such as Pascal, Descartes, Mme de Lafayette. One or more authors may be covered. May be repeated for credit with consent of instructor as different topics are studied from quarter to quarter.

*206C. **Seventeenth-Century Literature: Poetry** (4) III. Abraham Seminar—3 hours; term paper and/or exposé. Studies of the works of one or more poets of the period. May be repeated for credit with consent of instructor.

*207A. **Eighteenth-Century Literature: Philosophes** (4) II. Kusch Seminar—3 hours; term paper and/or exposé. Not a course in philosophy, but an examination of the role of philosophy in the design and context of literary works. Study of one or more authors. May be repeated for credit.

207B. **Eighteenth-Century Literature: Novel** (4) III. The Staff Seminar—3 hours. Rise of the novel. Study of narrative experiments in the context of the philosophical climate and new literary values. Course may treat one or more novelists of the period. May be repeated for credit when different topics are studied.

208A. **Nineteenth-Century Literature: Fiction** (4) I, Hannoosh Seminar—3 hours. Study of the works of one or several novelists and/or short-story writers of the period. May be repeated for credit with consent of instructor when different topics are studied.

*208B. **Nineteenth-Century Literature: 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) III. Blanchard Seminar—3 hours. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor when different topics are studied.

209A. **Twentieth-Century: Prose** (4) II, Coe; 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) III. The Staff Seminar—3 hours; term paper and/or exposé. Study of the works of one or several poets of the period. May be repeated for credit with consent of instructor.

210. **Studies in Narrative Fiction** (4) I. Praeger Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

211. **Studies in Criticism** (4) II. Blanchard Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

*212. **Studies in the Theater** (4) I. The Staff Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

213. **Studies in Poetry** (4) II. The Staff Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

*214. **Study of a Literary Movement** (4) III. The Staff Seminar—3 hours. May be repeated for credit with consent of instructor when different topic is studied.

238. **Advanced Literary Translation** (4) III. Bloomberg Seminar—3 hours; significant amounts of translation of texts. Designed to acquaint students with the basic principles of applied translation theory. Translation of texts chosen for their theoretical interest. Open to native French speakers only with consent of instructor.

*250A. **French Linguistics: Morphematics** (4) I, Manea-Manoliu Seminar—4 hours. Prerequisite: courses 159, 160, or consent of instructor. Theoretical approach to French grammar, with emphasis on morphematics, i.e., a semantic analysis of grammatical categories, as well as of their paradigmatic and syntactic relations. Offered in even-numbered years.

*250B. **French Linguistics: Transformational Syntax** (4) I, Manea-Manoliu Seminar—4 hours. Prerequisite: course 250A or consent of instructor. Presentation of French syntax exemplified by a core of transformational rules (such as subjectification, 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, Manea-Manoliu Seminar—3 hours; term paper. Prerequisite: course 250A or 250B or consent of instructor. Issues in contemporary French linguistic thought and their relationship to the development of theoretical linguistics. Topics such as pragmatics, semantics, symbolic logic, speech acts, etc. Intended for students in French linguistics or those interested in applying linguistic models to literature.

261. **Current Issues in Modern French Syntax** (4) II. Manea-Manoliu Seminar—3 hours; term paper. Presentation of contemporary approaches to French syntax. Explanations of various less regular phenomena, with reference to on-going changes in modern spoken French. Offered in even-numbered years.

290. **Research Methods** (2) I. Abraham 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 Study** (1-5) I, II, III. The Staff (S/U grading only.)

298. **Group Study** (1-5) I, II, III. The Staff (Chairperson in charge) Seminar—1-5 hours. May be repeated for credit with consent of instructor.

299. **Research** (1-12) I, II, III. The Staff (S/U grading only.)

299D. **Dissertation Research** (1-12) I, II, III. The Staff (S/U grading only.)

Professional Courses

300. **Teaching of a Modern Foreign Language** (3) III. 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.

Freshman Seminar Program

Jay Mechling, Ph.D., Program Director
Program Office, 17 Wellman (Teaching Resources Center)(752-6050)

Committee in Charge

Stephanie Beardsley, Ph.D. (Residence Life)
Alan Jackman, Ph.D. (President's Chair in Undergraduate Education)
Robert Powell, Ph.D. (College of Engineering)
David Robertson, Ph.D. (Committee on Educational Policy)
Mike Viazzoli (Student Representative, ASUCD—Academic Affairs)
Harry Walker, Ph.D. (College of Agricultural and Environmental Sciences)
Carolyn Wall, Ph.D. (College of Letters and Science)
Dan Wick, Ph.D. (Teaching Resources Center)

Course in Freshman Seminar

(Questions pertaining to the following course should be directed to the instructor or to the Teaching Resources Center.)

1. **Freshman Seminar** (2) I, II, III., The Staff Seminar—20 hours total (8 weeks). Prerequisite: open only to students who have completed less than 44 quarter units. Investigation of a special topic through shared readings, discussions, written assignments, and special activities (such as fieldwork, site visits, laboratory work, etc.). Emphasis upon student participation in learning.

Genetics

(College of Agricultural and Environmental Sciences)

John A. Kiger, Jr., Ph.D., Chairperson of the Department

Department Office, 357 Briggs Hall (752-0200)

Faculty

Francisco J. Ayala, Ph.D., Adjunct 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
John A. Kiger, Jr., Ph.D., Professor
Timothy Prout, Ph.D., Professor Emeritus
(Genetics, Entomology)
Raymond L. Rodriguez, Ph.D., Professor
Mark L. Sanders, Ph.D., Lecturer
Che-Kun J. Shen, Ph.D., Professor
S. Richard Snow, Ph.D., Professor Emeritus
G. Ledyard Stebbins, Ph.D., Professor Emeritus
Michael Turelli, Ph.D., 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 Environ-

mental 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, 376 Mrak Hall.

Genetics

B.S. Major Requirements:

(For convenience in program planning the usual courses taken to satisfy the requirements are shown in parentheses where possible. Equivalent or more comprehensive courses are acceptable. *Courses shown without parentheses are required.*)

	UNITS
Preparatory Subject Matter	64-73
Microbiology 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 6A-6B-6C)	12
Zoology 2; 2L recommended	4-6
Depth Subject Matter	26-27
Biochemistry 101A-101B	6
Genetics 100, 100L, 102A, 102B	11
Three additional courses in genetics	9-10
Include at least one course from Genetics 104, 107; and one course from Genetics 103, 105, 106.	
Breadth Subject Matter	36
<i>College of Agricultural and Environmental Sciences students:</i>	
English and/or rhetoric (see College requirement)	8
Social sciences and/or humanities†	28
See College section for additional requirements.	
<i>College of Letters and Science students:</i>	
Refer to College section 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, or systematics.	
Unrestricted Electives	14-36
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.

Related Courses. See Agronomy 221, 222, 223, 224, 225, 230, Animal Genetics 107, 108, 109, 204, 206, 207, 208, Anthropology 151, 152, 153, 157, 157L, Biochemistry and Biophysics 153, 201C, Biological Chemistry 217, Genetics Graduate Group, Plant Pathology 215, Plant Science 103, 113, 122, Psychology 251, Vegetable Crops 220, 220L, 221, 221L, Zoology 148, 149.

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Courses in Genetics

Lower Division Courses

10. Heredity and Evolution (4) I, III. The Staff
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. General Education credit: Nature and Environment/Introductory.

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. Principles of Genetics (4) I, II, III, Summer. The Staff
Lecture—4 hours. Prerequisite: Biological Sciences 1; Microbiology 2; Botany 2 or Zoology 2. Introduction to genetics, emphasizing DNA structure and function and gene regulation. Additional topics covered are transmission genetics, cytogenetics and evolutionary genetics.

100L. Principles of Genetics Laboratory (2) I, II. The Staff
Lecture—1 hour; laboratory—3 hours. Prerequisite: course 100; Microbiology 102L or Microbiology 3. Laboratory work in basic genetics including gene mapping and isolation of mutants.

102A. Molecular Genetics (3) II. Rodriguez
Lecture—3 hours. Prerequisite: course 100; Biochemistry 101B. Prokaryotic molecular genetics including DNA structure and replication, restriction analysis, sequencing, transcription, translation and gene regulation.

102B. Molecular Genetics (3) III. The Staff
Lecture—3 hours. Prerequisite: course 102A. Continuation of course 102A, emphasizing fundamental discoveries in eukaryotic molecular genetics.

102L. Advanced Molecular Genetics Laboratory (4) III. Rodriguez, ———
Lecture—1 hour; laboratory—9 hours. Prerequisite: courses 100L, 102A, Biochemistry 101L, and consent of instructor; Microbiology 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. The Staff
Prerequisite: course 100. Evolution in higher organisms including genetic structure in populations, speciation, macroevolution, and history of life.

104. Developmental Genetics (3) II. Kiger
Lecture—3 hours. Prerequisite: course 100; Biochemistry 101A and Zoology 100 recommended. Current aspects of developmental genetics. Historical background and current genetic approaches to the study of development of higher animals.

105. Population Genetics (4) I, Gillespie
Prerequisite: course 100; a course in statistics and Mathematics 16B. Population genetics including the effects of natural selection, migration, mutation and genetic drift.

106. Evolutionary Quantitative Genetics (3) II. Turelli
Lecture—3 hours. Prerequisite: course 100, Mathematics 16C, and Statistics 102. Experimental and theoretical analysis of polygenic traits. Topics include classical experiments and methods of analysis as well as modern theoretical treatments with emphasis on applications to microevolution and macroevolution.

107. Human Genetics (3) I, Sanders
Lecture—3 hours. Prerequisite: course 100 or the equivalent. Human molecular genetic variation, molecular basis of metabolic disorders, chromosome aberrations and consequences, diseases associated with the immune system, and statistical techniques for estimating genetic and environmental effects.

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.)

192. Internship (1-12) I, II, III. The Staff
Laboratory—3-36 hours. Prerequisite: course 100 and consent of instructor. Technical or practical experience on or off campus, and supervised by member of Genetics faculty. (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. (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 Microbiology 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 and speciation, and biochemical and morphological evolution 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.

***209. Molecular Evolution (3) III.** Gillespie, Gottlieb, Turelli
Lecture—3 hours. Prerequisite: Biochemistry 101B; course 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.)

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. (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.)

Genetics (A Graduate Group)

G. Eric Bradford, 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

200. Advanced Transmission Genetics (4) II. Members of Genetics Group
Lecture—3 hours; discussion—1 hour. An advanced survey

of the fields of transmission genetics and cytogenetics, designed primarily for first-year students in the Genetics Group.

220. Advanced Genetics Laboratory (5) I, II, III. The Staff Laboratory—15 hours. Prerequisites: Genetics 100 or the equivalent; enrollment in Genetics Graduate Group. Student is assigned to genetics research laboratory. Individual research problems with emphasis on methodological/procedural experience and experimental design. May be repeated twice for credit, in different laboratories. (S/U grading only.)

291. Seminar in History of Genetics (2) III. Griesemer (Philosophy) Seminar—2 hours. Prerequisite: Genetics 100. 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.

296. Group Study (1-5) I, II, III. Members of the Group (Chairperson in charge) Prerequisite: consent of instructor. Group Study of selected topics in Genetics. (S/U grading only.)

299. Research (1-12) I, II, III. Members of the Group (Chair person in charge) (S/U grading only.)

Geography

(College of Letters and Science)

Stephen C. Jett, Ph.D., Chairperson of the Department

Department Office, 280 Kerr Hall (752-0790)

Faculty

Conrad J. Bahre, Ph.D., Associate Professor

Mary B. Cunha, M.A., Lecturer

Robin E. Datel, Ph.D., Lecturer

³Dennis J. Dingemans, Ph.D., Associate Professor

^{2,3}Deborah L. Elliott-Fisk, Ph.D., Assistant Professor

Howard F. Gregor, Ph.D., Professor

Louis E. Grivetti, Ph.D., Professor (*Geography, Nutrition*)

Stephen C. Jett, Ph.D., Professor

Deryck O. Lodrick, Ph.D., Lecturer

Marilyn L. Shelton, Ph.D., Associate Professor

Frederick J. Simoons, Ph.D., Professor

Kenneth Thompson, Ph.D., Professor Emeritus

The Major Program

Geography is a multifaceted discipline defined by its concern with place. Since antiquity, geography has embraced four traditions: spatial; area studies; Man-land; and earth sciences. Geographers strive to answer spatial questions regarding the earth's surface and adjacent atmosphere and to describe and explain the character of regions; to ascertain the ways in which humans, historical and contemporary, have shaped the earth's surface; and to understand the physical, biotic, and human systems of our global environment and their mutual interactions.

The curriculum of 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 a general program, or specialize in cultural/historical geography, economic/urban geography, physical geography (including biogeography), or regional planning and analysis. The Bachelor of Science program is for students with strong science backgrounds who are 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. Geography is an essential component of a liberal education, and the major is intended to provide an opportunity for broad intellectual enrichment. Students trained in undergraduate geography have advantages in pursuing careers in international trade, travel, and politics; environment- and resource-oriented government employment; cartography and remote sensing; primary and secondary education; and regional planning.

Geography

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	10
Geography 1, 2, and 5	10
Depth Subject Matter	37-44
Geography 105 or 106, 151, and one UCD regional course from Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, 127	11-12
Choose one emphasis from the following five:	
<i>Emphasis I (General)</i>	24-28
One course from each of the following three groups:	
a. Geography 170 and 171	
b. Geography 141 and 155	
c. Geography 108 and 115	
Four additional upper division geography courses.	
<i>Emphasis II (Cultural/Historical)</i>	28
Geography 170, 171, one course from 108, 115, 141, 155.	
Four additional courses from Geography 110, 143, 172, 173, 175.	
<i>Emphasis III (Economic/Urban)</i>	26
Geography 110, 141, 155, one course from 108, 115, 170, 171.	
Three additional courses from Geography 104, 142, 143, 156, 160, 161, 162.	
<i>Emphasis IV (Physical)</i>	31-32
Geography 3, 108, 110, 115, 162, 173, one course from 141, 155, 170, 171.	
One additional course from Geography 102, 112, 116, 117, 161.	
<i>Emphasis V (Regional Planning and Analysis)</i> ..	26-32
Geography 155 or 156, 110, one additional course from 121-127, and one course from 142, 160, 161, 162, 170, 173.	
Environmental Planning and Management 110 and 134, or Environmental Studies 171; Political Science 107 or Environmental Studies 161, plus one course from Economics 115A, Agricultural Economics 148, or Geology 134.	
Total Units for the Major	47-54

Recommended: Geography 4.

Geography

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	57-64
Geography 1, 2, 3, and 5	16
Statistics 13 or the equivalent	4
Mathematics 16A, 16B, and 16C; or Mathematics 21A, 21B, and 21C	9-12

Computer Science Engineering 10 or 30	3-4
Chemistry 1A-1B-1C or 4A-4B-4C	15
Biology Sciences 1	5
Zoology 2-2L or Botany 2 or Geology 60-60L or Physics 6A-6B	5-8
Depth Subject Matter	43-45
Geography 105, 106, 108, 115, 151	20
Two courses from Geography 102, 110, 112, 116, 117, 162, 173	7-8
One course from Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, 127	3-4
Four additional upper division, letter-graded units in Geography	4
Nine additional upper division units chosen in consultation with the undergraduate adviser	9
Total Units for the Major	100-109

Recommended

Geography 4; Physics 8A-8B-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. When choices of individual courses are required, these must be made in consultation with the major adviser.

	UNITS
Geography	19-20
<i>Minor I (General)</i>	
Geography 151, plus one course from each of the following four groups:	
Geography 108, 115 or 173	
Geography 170 or 171	
Geography 155, 160, or 161	
Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127	
<i>Minor II (Physical)</i>	
Geography 102, 108, 115 and 173, plus one course from 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127.	
<i>Minor III (Cultural)</i>	
Geography 170, 171, and 173, plus one course from each of the following two groups: Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127, and Geography 143, 172, or 175	
<i>Minor IV (Economic)</i>	
Geography 110 and 141, plus one course from each of the following three groups:	
Geography 142, 143, or 156	
Geography 160, 161, 162, or 170	
Geography 121, 122A, 122B, 123, 124, 125A, 125B, 126, or 127.	
<i>Minor V (Environmental/Resource)</i>	
Geography 160, 161, 162, 173, and 175.	
<i>Minor VI (World Regional)</i>	
Geography 121, 122A or 122B, 123 or 124, 125A or 125B, 126 or 127.	

Major Adviser. See *Class Schedule and Room Directory*.

Graduate Study. The department offers programs of study leading to the M.A. and Ph.D. degrees. Information concerning these programs may be obtained from the Graduate Adviser, Department of Geography.

Graduate Adviser. See *Class Schedule and Room Directory*.

Courses in Geography

Lower Division Courses

- 1. Physical Geography** (4) I, —, II, Jett; III, — 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** (3) I, II, III. Simoons Lecture—3 hours. Traditional systems of habitat use: their characteristics, origin, occurrence, ecology. Development of contemporary cultural patterns and patterns in man-land relationships. Emphasis on the nonindustrial world. General Education credit with concurrent enrollment in course 2G: Contemporary Societies/Introductory.

2G. Introduction to Cultural Geography: Discussion (1) I, II, III. Simoons

Discussion—1 hour; short papers. Prerequisite: course 2 concurrently. Small group discussion of topics and readings assigned for course 2. Preparation and discussion of short papers. General Education credit with concurrent enrollment in course 2: Contemporary Societies/Introductory.

3. Climate and Weather (4) I, II. 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 (3) I, Gregor; II, Lodrick; III, Gregor

Lecture—3 hours. The location of economic and urban activities. Patterns and theories of spatial organization: resource development, agricultural and manufacturing regions, urban systems, and urban structure. General Education credit with concurrent enrollment in course 5G: Contemporary Societies/Introductory.

5G. Economic and Urban Geography: Discussion (1) I, Gregor; II, Lodrick; III, Gregor

Discussion—1 hour; short papers. Prerequisite: course 5 concurrently. Small group discussion of topics and readings assigned for course 5. Preparation and discussion of short papers. General Education credit with concurrent enrollment in course 5: Contemporary Societies/Introductory.

6. Human Impacts on the Landscape (4) I, Jett; III, ———

Lecture—4 hours. Local and global effects, through time, of human occupation, economies, and technologies on wild and domesticated flora and fauna; soils; water; landforms; climate. Emphasis on landscape modification. Not intended for students planning to take course 161 or 170.

10. The World's Regions (3) I, Dingemans; II, Dingemans, III, Jett

Lecture—3 hours. The major geographic regions of the world; their origins, physical environments, cultures and economies; their interactions and global roles. Designed for non-majors.

***50. Geography and Environmental and Regional Planning** (3) III. Dingemans

Lecture—3 hours. Principles of spatial planning for regional change. Policies for environmental, economic, and social modifications. Illustrated case studies include: U.S. city planning, USSR industrial and population shifts, European regional plans, Chinese agricultural and environmental programs.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Independent Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor, primarily for lower division students. (P/NP grading only.)

Upper Division Courses

102. Field Course in Physical Geography (4) III.

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) II. Bahre

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) III. Cunha

Lecture—1 hour; laboratory—8 hours. Prerequisite: course 105. Advanced principles and techniques of cartographic representation. Emphasis on scribing, plate-making, process

photography, color separation, and color proofing. Use of contemporary cartographic and photographic equipment utilized in producing maps.

108. Analysis of Landforms (4) I, Elliott-Fisk

Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Introduction to landforms and geomorphic processes. Topics include structural landforms, rock weathering and soil genesis, hillslope processes, and fluvial, glacial, and coastal landscapes.

110. Quantitative Spatial Analysis (4) II. Dingemans

Lecture—3 hours; term paper. Prerequisite: course 1, 2, or 5, and Statistics 13 or 102 recommended. Methods for geographic research and location planning; quantitative summary and analysis of spatial data patterns and trends; optimal-location solutions; includes correlation, regression, and use of pre-packaged computer programs.

***112. Coastal Landforms and Landscapes** (4) III. Elliott-Fisk

Lecture—3 hours; discussion—1 hour. Prerequisite: course 108 or consent of instructor. Examination of the landforms and geomorphic processes found along coasts. Analyses of coasts in a variety of lithologic, tectonic, and "wave-climate" settings. Emphasis on the Quaternary history of coastal landscapes. Offered in even-numbered years.

115. Mesoclimatology (4) II. Shelton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 3. Areal energy and moisture exchanges at the earth/atmosphere interface: physical controls, spatial and temporal variations, measuring and modeling the exchange processes, classification of mesoclimates. Climatic and related processes in areal systems. Human alteration of mesoclimates. Offered in odd-numbered years.

***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 the character, timing, and magnitude of environmental changes during the Quaternary (Pleistocene and Holocene). Analysis of methods of paleo-environment identification. Survey of the Quaternary record for selected regions.

***120. Deserts of California and the Southwest** (3) II. Jett

Lecture—3 hours. Prerequisite: courses 1 and 2 or the equivalent recommended. Physical and human geography of the Mojave, Sonoran, and Chihuahuan deserts of the U.S., the Colorado Plateau, and the southern Great Basin. Desert origins, climate, vegetation, and landforms. Cultures and histories of native tribes, Hispano-Americans, and Anglo-Americans. Offered in odd-numbered years.

***120L. Field Excursion to Californian and Southwestern Deserts** (2) III. Jett

Fieldwork—60 hours minimum (1 week). Field excursion to examine physical and human geography of selected desert areas in California and/or Nevada, Arizona, and Utah. May be repeated for credit. Limited enrollment; preference given to students having completed course 120. (P/NP grading only.) Offered in odd-numbered years.

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) III, Bahre

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy from Mexico to Panama and in the Caribbean. Emphasis on understanding the evolution of the diverse natural and cultural landscapes of Middle America. Approach will be cultural/historical and ecological. Offered in odd-numbered years.

***122B. South America** (4) II. Bahre

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 1 and 2 or consent of instructor. Environment, culture, and economy in the South American countries. Emphasis on understanding the evolution of the diverse natural and cultural landscapes of South America. The approach will be cultural/historical and ecological. Offered in even-numbered years.

123. Western Europe (3) I, Datal

Lecture—3 hours. Prerequisite: courses 1 and 2 or consent of instructor. Geographic conditions and their relation to the economic, social, and political problems of the countries of Western Europe.

124. The Soviet Union and Eastern Europe (4) II. Dingemans

Lecture—3 hours; discussion—1 hour. Prerequisite: an introductory course in the social sciences; course 2 or 5 recommended. Human use of the land in the Soviet Union and Eastern Europe. Location and nature of resources, agriculture, industry, and cities. Emphasis on modification of traditional

landscapes by the Soviet model of planning for regional development. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: a course from Geography 2, 5, Economics 1A-1B, Anthropology 2, or Political Science 2.

***125A. North Africa and the Middle East** (4) I, Grivetti

Lecture—4 hours. Prerequisite: courses 1 and 2 or consent of instructor. Geography of the Islamic world of North Africa and Southwest Asia; climatic and physical features; cultural areas, settlement patterns, and the influence of Islam; economic patterns and development.

125B. Sub-Saharan Africa (3) II. Simoons

Lecture—3 hours. Prerequisite: courses 1 and 2 or consent of instructor. Physical, cultural, and historical geography of Africa south of the Sahara.

***126. Southern Asia** (3) III. Simoons

Lecture—3 hours. Prerequisite: courses 1 and 2 or consent of instructor. Physical, cultural, and historical geography of Southern Asia. Offered in even-numbered years.

***127. Contemporary East Asia** (4) III. Dingemans

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory course in the social sciences; course 2 or 5 recommended. Human use of the earth in East Asia. Location and nature of resources, agriculture, industry, and cities. Modernization of traditional rural and urban landscapes. Emphasis on contemporary China and Japan as contrasting paths to economic development.

131. California (4) III.

Lecture—3 hours; discussion—1 hour. The regional nature and variety of California: landforms, climates, vegetation, and soils; water, agriculture, and the cities. Ecological problems caused by increasing population and technological pressures on these environments.

***141. Organization of Economic Space** (4) 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, historical, cultural, and economic factors have influenced these aspects of agriculture. Current and future trends and associated resource problems.

143. Political Geography (4) II. Lodrick

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.

***155. Urban Geography** (4) II. Dingemans

Lecture—3 hours; term paper. Prerequisite: course 5 or consent of instructor. Geography of land use within cities. The processes of change, and theories of economic and social organization of urban space. The urban landscape as a product of history, planning policy, transportation systems, and residential structure. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Geography 5.

156. The Urban Region (4) I, 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) III.

Lecture—4 hours. Principles of natural-resource and environmental-quality conservation. Land use conflicts between forestry, agricultural, mining, municipal, and recreational interests. Roles of industry, government, and society in creating and resolving resource and environmental problems.

162. Geography of Water Resources (4) I, Shelton

Lecture—3 hours; 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) III. 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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Anthropology 2 or Geography 2.

171. Cultural Geography (4) II. Jett
Lecture—3 hours; term paper. Prerequisite: course 2 or consent of instructor. Consideration of principal concepts and approaches in cultural geography in modern times, and links with, and parallels in, other disciplines. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Geography 2 or Anthropology 2.

172. Animals and Culture History (4) III. 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) I. 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 even-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 undergraduate Geography major adviser and consent of instructor. Supervised program of student internships with public agencies dealing with geographical problems. The application and evaluation of the theoretical concepts through work experience with a variety of assignments and work schedules. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates. (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Research Trends in Geography (1) I. The Staff (Chairperson in charge)
Seminar—1 hour. Major current research themes and trends in geography. (S/U grading only.)

201. Sources and General Literature of Geography (4) I, II, III. The Staff
Discussion—4 hours. Prerequisite: graduate status in geography; consent of instructor. Designed for students preparing for higher degrees in geography. May be repeated for credit in one or more of the following subfields: physical, cultural, economic, urban, historical, political, conservation, and regional geography.

***290. Seminar: Selected Regions** (4) III.
Seminar—3 hours. Region to be announced annually.

***291. Seminar in Cultural Geography** (4) II. Simoons
Seminar—3 hours.

292. Seminar in Plant Geography (4) II. Bahre
Seminar—3 hours; seminar paper. Prerequisite: graduate standing. Examination of that aspect of cultural plant geography dealing with human impacts and vegetation change in the earth's major biomes. Particular emphasis on the New World's savannas, deserts, and grasslands. Offered in odd-numbered years.

***293. Seminar in Political Geography** (4) I.
Seminar—3 hours.

294. Seminar in Climatology (4) III. Shelton
Seminar—3 hours.

***295. Seminar in Urban Geography** (4) III. Dingemans
Seminar—3 hours.

296. Seminar in Agricultural Geography (4) I, Elliott-Fisk
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)

Harry W. Green II, Ph.D., Chairperson of the Department

Department Office, 174 Physics-Geology Building

Faculty

Sandra J. Carlson, Ph.D., Adjunct Lecturer
Richard Cowen, Ph.D., Professor
Howard W. Day, Ph.D., Professor
James A. Doyle, Ph.D., Professor (*Botany*)
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., Associate Professor
Eldridge M. Moores, Ph.D., Professor
Jeffrey F. Mount, Ph.D., Associate Professor
Dennis R. Ojakangas, Ph.D., Lecturer
Peter Schiffman, Ph.D., Adjunct Lecturer
Philip W. Signor, Ph.D., Assistant Professor
Robert J. Twiss, Ph.D., Associate Professor
Kenneth L. Verosub, Ph.D., 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. Requirements for both programs include a number of elective courses which provide students the opportunity to emphasize different aspects of the field. Courses to fulfill these elective requirements must be chosen to provide a coherent and in-depth program of study and must be approved by an undergraduate adviser before they are taken. In either program, additional courses may be elected to increase the depth or breadth of a student's knowledge.

High school students should note that the preparation for either program requires high school chemistry and four years of mathematics or the equivalent. For transfer students applying to the B.S. degree program, it is strongly recommended that they have completed a course in physical geology with laboratory or mineralogy with laboratory, and the equivalent of either Chemistry 1A-1B-1C or Physics 6A-6B-6C as well as Mathematics 21A-21B-21C.

Geology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	44-45
Geology 3, 3L, 50, 50L, 60, 60L	14
Mathematics 16A-16B-16C or 21A-21B	6-9
Chemistry 1A-1B or 4A-4B	10
Physics 6A-6B-6C	12
Depth Subject Matter	39
Geology 102, 105, 105L, 106, 110, 110L, 122, 123	27
Additional upper division electives chosen from selected courses in geology and related fields approved <i>in advance</i> by the major adviser (see adviser for list of approved courses)	12
Total Units for the Major	83-84

Recommended

Chemistry 1C or 4C; Geology 3, 3L; Statistics 13 or 102.

Geology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	56
Geology 3, 3L, 50, 50L, 60, 60L	14
Mathematics 21A-21B-21C	12
One course chosen from Mathematics 22A, 22B, 22C, Statistics 32, 102	3
Chemistry 1A-1B-1C; or preferably 4A-4B-4C	15
Physics 6A-6B-6C or 6A-6B-6C	12
Depth Subject Matter	54
Geology 102, 105, 105L, 106, 110, 110L, 118, 122, 123	35
Geology 190 (repeat course at least once)	2
One course chosen from Geology 124, 125	5
Additional upper division electives chosen from selected courses in geology and related fields approved <i>in advance</i> by major adviser (see adviser for list of approved courses)	12
Total Units for the Major	110

Recommended

Electives for general geology emphasis: Geology 106, 108L, completion of 124, 125 sequence plus one other course (consult adviser).

Additional recommended courses: one or more of the following courses, depending on emphasis in geology: Mathematics 22A, 22B, 22C, Statistics 104, 106, 108, 110.

Major Advisers. A.B. degree: C.G. Higgins; B.S. degree: A.A. Finnerty, C.G. Higgins, P.W. Signor.

Minor Program Requirements:

Students in other disciplines may elect to complete a minor in Geology by choosing a geological subject emphases. On transcripts the minor will appear as a minor in *Geology*.

	UNITS
Geology	19-24
The minor must be chosen from one of the following emphases:	
Economic emphasis	19-20
Geology 115, 117A, 117B, 130, 170	16
One course chosen from Economics 123, Engineering 160, Geology 152, 181	3-4
Minor Adviser.	
Engineering emphasis	20-21
Civil Engineering 171, 172	5
Geology 117A, 117B, 134, 175	12
Soil Science 118 or 120	2-4
Minor Adviser. R.A. Matthews.	
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. K. L. Verosub.	
Geochemistry emphasis	18-20
Chemistry 110A, 110C	6
(Chemistry majors must substitute one of the elective courses for Chemistry 110C.)	
Geology 80, 60L, 115, 180	9
One elective course chosen from Chemical Engineering 151, Chemistry 126, Engineering 130, 134, Geology 150A, Soil Science 102, Water Science 160	3-5
Minor Adviser.	
Geomorphology emphasis	21-22
Geology 106, 134, 152, 153	14
Soil Science 120	2
At least one course chosen from Civil Engineering 171, Geography 112, 117, Geology 154, Soil Science 120	2-4

Minor Adviser. C. G. Higgins.

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 Science Engineering 112, 151, 161;	
(c) Geology 105, 162, Physics 105C;	
(d) Mathematics 128A, 128B, 128C;	
(e) Physics 104A, 104B, 105C.	

Minor Adviser. J. S. McClain.

Oceanography emphasis	20-25
Geology 106, 116, 150A, 150B, 150C	17
One course chosen from Environmental Studies 100, 151, Geology 111A, 111B, S119, Water Science 180	3-8

Minor Adviser. S. V. Margolis.

Paleobiology emphasis	20-24
Botany 140	4
Geology 107, 107L, 111A, 111B	13
At least one course chosen from Anthropology 152, Genetics 103, Geology 138, 150C, S119, Zoology 112, 125, 147, 148, 149	3-7

Minor Adviser. J. H. Lipps.

Teaching Credential Subject Representative. C. G. Higgins. See also under Teacher Education Program.

Graduate Study. The Department of Geology offers a program of study and research leading to the M.S. and Ph.D. degrees. For information regarding graduate study in geology, address the Graduate Adviser, Department of Geology.

Graduate Advisers. H. W. Day, R. Cowen, J. S. McClain.

Courses in Geology

Lower Division Courses

- 1. The Earth (3) I, Matthews; III, Higgins**
Lecture—3 hours. Introduction to study of the Earth for those not majoring in geology or associated sciences. Not open for credit to students who have taken course 50. General Education credit with concurrent enrollment in course 1G: Nature and Environment/Introductory.
- 1G. Earth: Discussion (1) I, Matthews, III, Higgins**
Discussion—1 hour. Prerequisite: course 1 concurrently. Small group discussions and preparation of short papers for course 1. General Education credit with concurrent enrollment in course 1: Nature and Environment/Introductory.
- 1L. Earth Laboratory (1) I, Matthews; 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.
- 3. History of Life (3) II, Cowen**
Lecture—3 hours. Prerequisite: course 1 recommended. The history of life during the three and one-half billion years from its origin to the present day. Origin of life and processes of evolution; how to visualize and understand living organisms from their fossil remains. General Education credit with concurrent enrollment in course 3G: Nature and Environment/Introductory.
- 3G. History of Life: Discussion (1) II, Cowen**
Discussion—1 hour. Prerequisite: course 3 concurrently. Small group discussion and preparation of short papers for course 3. General Education credit with concurrent enrollment in course 3: Nature and Environment/Introductory.
- 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.
- 12. Evolution and Paleobiology of Dinosaurs (2) I. The Staff**
Lecture—2 hours. Introduction to evolutionary biology, paleobiology, ecology and paleoecology, using dinosaurs as case studies.
- 17. Earthquakes and other Earth Hazards (2) I, Verosub**
Lecture—2 hours. The impact of earthquakes, volcanoes, landslides and floods on Man, his structures and his environment. Discussion of the causes, effects, and solution of geologic problems in rural and urban settings.

20. Geology of California (2) II, 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, Moores, 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, Moores, 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) I, Day, 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) I, Day, 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
Lecture—1 hour; laboratory—2 hours; field study—8 full days. Prerequisite: courses 105L, 106, 123; course 124 or 125 recommended. Instruction in geologic mapping techniques; field geologic study of selected areas to expose students to a variety of geologic features. A geologic map, cross-section stratigraphic section and description of geologic rock units is required (30 hours minimum).

105. Structural Geology (3) II, Moores, Twiss
Lecture—3 hours. Prerequisite: courses 50-50L; Physics 6A 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) II, Moores, 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 (4) I, Margolis
Lecture—3 hours and laboratory—3 hours (includes 3 one-day field trips). Prerequisite: courses 50, 50L. Study of modern and ancient environments from continents, coasts, shelves and deep oceans. Ecology of fossils, sedimentary processes; stratigraphy, identification of diagnostic rock types, geological map making; recognition of ancient environments.

***107. Principles of Paleobiology (3) III, 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. No credit allowed to those who have completed course 110.

***107L. Principles of Paleobiology Laboratory (2) III, 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. No credit allowed to those who have completed course 110L.

108. Regional Structure and Stratigraphy (3) III, Moores
Lecture—3 hours. Prerequisite: courses 105, 105L, 106. Global tectonic features and processes. Structure, stratigraphy, and evolution of large-scale features of the earth's crust; shield and platforms, continental margins, ocean basins, plate boundaries and mountain belts.

108L. Regional Structure and Stratigraphy Laboratory (2) III, Moores
Laboratory—6 hours; two one-day field trips. Prerequisite: course 108 (preferably taken concurrently). Illustration of topics covered in course 108. Emphasis on the interpretation of geologic history using geologic maps selected from a variety of structural and stratigraphic provinces.

110. Introductory Paleontology (3) I, Signor
Lecture—3 hours. Prerequisite: courses 3, 3L. Provides ge-

ology majors with a thorough introduction to the fossil record, interpretation of data from the fossil record, and associated problems of evolution, paleoecology, and biostratigraphy.

110L. Invertebrate Paleontology Laboratory (2) I, Signor
Laboratory—6 hours. Prerequisite: courses 3, 3L, 110 (may be taken concurrently). Systematics and morphology of the major invertebrate fossil groups, with special emphasis on interpretation of fossil paleoecology and evolution.

***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. Offered in odd-numbered years.

***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. Offered in odd-numbered years.

113. The Solar System (3) III, The Staff
Lecture—3 hours. Prerequisite: one course in physical science. Nature of the Sun, Moon and planets as determined by recent manned and unmanned exploration of the solar system. Comparison of terrestrial, lunar and planetary geologic processes. Search for life. Origin and evolution of the solar system. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: any introductory physical science GE course in the area of Nature and Environment.

115. Geochemistry (3) III, The Staff
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, Lipps, 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; and utilization of marine resources. (Same course as Environmental Studies 116.) General Education credit with concurrent enrollment in course 116G: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Science 10, Chemistry 10, or Geology 1.

***116G. The Oceans: Discussion (2) II, Lipps**
Discussion—2 hours. Prerequisite: course 116/Environmental Studies 116 concurrently. Scientific method applied to discovery of the processes, biota and history of the oceans. Group discussion and preparation of papers. (Same course as Environmental Studies 116D.) General Education credit with concurrent enrollment in course 116: Nature and Environment/Non-Introductory. Recommended GE prerequisite: see course 116 above.

117A. Geophysics: Gravity and Magnetism (3) II, Verosub
Lecture—3 hours; field experience with geophysical instruments. Prerequisite: Physics 8B and Mathematics 21C or consent of instructor. Introduction to the use of physics in the study of earth structures and processes: gravity, paleomagnetism, geomagnetism. Application to geophysical exploration as well as solid earth geophysics.

***117B. Geophysics: Seismology and Heat Flow (3) I, McClain**
Lecture—3 hours; field experience with geophysical instruments. Prerequisite: Physics 6C 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. Mount Six weeks in field. Prerequisite: course 102. Preparation of a geologic map and report on a selected field area.

122. Optical Mineralogy (3) II, Schiffman
Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 60, 60L or consent of instructor. Optical properties of crystals and techniques of mineral identification with the petrographic microscope.

123. Igneous Petrology (5) III, 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) II, Mount
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122. Origin and occurrence of sedimentary rocks. Laboratory exercises emphasize the study of these rocks in hand specimen and thin section.

125. Metamorphic Petrology (5) I, Day
Lecture—3 hours; laboratory—6 hours. Prerequisite: course 122; course 123 recommended. Occurrence and origin of metamorphic rocks. Laboratory exercises emphasize the study of these rocks in hand specimen and thin section.

130. Non-Renewable Natural Resources (3) I. Matthews
Lecture—3 hours. Prerequisite: course 1. Origin, occurrence, and distribution of non-renewable resources, including metallic, nonmetallic, and energy-producing materials. Problems of discovery, production, and management. Estimations and limitations of reserves, and their sociological, political and economic effects.

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.** The Staff
Lecture—1 hour; seminar—2 hours. Prerequisite: courses 3, 3L, 106. 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. The Staff
Lecture—2 hours. Prerequisite: upper division standing and a major in Geology. Collection, organization and presentation of data for geologic reports. Participants will analyze published reports, write syntheses of published reports and write abstracts.

145. Paleocology (3) II. Signor
Lecture—3 hours. Prerequisite: course 107. Principles and methods of environmental reconstruction of ancient animal and plant communities. Course includes statistical methods in paleocology; principles of biostratigraphy.

146. Evolutionary Paleontology (3) I. 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. Offered in even-numbered years.

150A. Physical and Chemical Oceanography (4) III. Powell (Environmental Studies)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 116 or Environmental Studies 118; 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. Offered in odd-numbered years. (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. 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. Offered in even-numbered years. (Same course as Environmental Studies 150C.)

152. Photogeology and Remote Sensing (4) II. Higgins
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 1L or 50L; course 105 recommended. Field use of aerial photographs: types and availability, stereoviewing, and basic geometry. Geological uses and interpretation of aerial photographs and of images obtained by remote sensing.

***153. Geomorphology (4) II.** Higgins
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 50-50L or 1-1L; Geography 1 recommended. Landforms, landscapes, and the processes that shape them. An introduction to geomorphic observation and theory. Alternates with and complements course 154. Offered in even-numbered years.

***154. Environmental Geomorphology (3) II.** Higgins
Lecture—3 hours. Prerequisite: courses 50-50L or 1-1L; Geography 1 recommended. Aspects of geomorphology that relate to Man's use of the natural environment. Alternates with and complements course 153. Offered in odd-numbered years.

162. Stress and Deformation (4) II. 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. So-

lution 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.** The Staff
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. Sample Preparation and Techniques (1) II. Winter
Laboratory—3 hours. Prerequisite: course 122. Introduction to petrographic laboratory techniques for petrographers. Topics covered may include thin and polished section preparation, rock crushing/grinding, mineral separation, staining, and photomicroscopy. (P/NP grading only.)

185. Advanced Field Geology (1-6) I, II, III. The Staff
Fieldwork—3-18 hours; report. Prerequisite: course 118 or graduate standing in Geology. Advanced problems and methods in geologic field studies; preparation of a geologic report. May be repeated for total of 6 units when different subject matter studied.

190. Seminar in Geology (1) I, II, III. The Staff
Discussion—1 hour; seminar—1 hour. 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 106 or consent of instructor. Advanced historical geology; analysis of stratigraphy and geologic history of North America and selected parts of other continents. Emphasis on interpreting lithologic assemblages and stratigraphic relations in terms of modern tectonic-depositional models. Offered in odd-numbered years.

***209. Origin and Significance of Metamorphic Textures (4) III.** Green
Seminar—3 hours; laboratory—3 hours. Interpretation of metamorphic textures in terms of surface energy anisotropy, growth anisotropy, crystal deformation processes, and disequilibrium phenomena. Offered in 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.

***215. Advanced Geochemistry (3) I.** The Staff
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) I. Moores
Seminar—3 hours. Prerequisite: course 108 or consent of instructor. Nature and evolution of tectonic features of the Earth. Causes, consequences, and evolution of plate motion, with selected examples from the Earth's deformed belts.

***217. Topics in Geophysics (3) III.** Verosub
Lecture—1 hour; seminar—2 hours. Prerequisite: consent of instructor. Discussion and evaluation of current research in a given area of geophysics. Topic will change from year to year. May be repeated for credit. Offered in odd-numbered years.

218A. Structural Analysis I: Macrofabrics (3) II. Twiss
Seminar—3 hours. Prerequisite: consent of instructor. Geometric and kinematic analysis and interpretation of meso-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) III.** 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 even-numbered years.

***226. Advanced Sedimentation and Sedimentary Petrology (4) III.** Mount
Lecture—2 hours; laboratory—6 hours. Prerequisite: course 124 or consent of instructor. Advanced petrographic and stratigraphic study of major sedimentary rock suites. Lecture emphasis on recognition and interpretation of the spatial and temporal variations in sedimentary rock textures and mineralogies. Laboratory focus on provenance and diagenesis. Subjects vary yearly. May be repeated for credit. Offered in even-numbered years.

228. Marine Geology (3) II. Margolis
Lecture—3 hours. Prerequisite: courses 106, 116, 150B or 185, 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.

***236. Inverse Theory in Geology and Geophysics (3) II.** McClain
Lecture—3 hours. Prerequisite: consent of instructor. Inversion of data for model parameters. Evaluation of parameter uncertainties. Linear and nonlinear problems for discrete and continuous models. Bakus-Gilbert inversion. Offered in even-numbered years.

***238. Theoretical Seismology (3) II.** McClain
Lecture—3 hours. Prerequisite: consent of instructor. Elastodynamic wave equation. Greens functions and source representations. Ray theory. Plane and spherical waves and boundary conditions. Elastic wave propagation in stratified media. (P/NP grading only.) Offered in odd-numbered years.

***241. Geomagnetism (3) I.** Verosub
Lecture—3 hours. Prerequisite: graduate standing. Nature and origin of the Earth's magnetic field. Present field and recent secular variation. Spherical harmonic analysis. Paleosecular variation. Polarity transitions and geomagnetic excursions. Statistics of polarity intervals. Dynamo theory. Planetary magnetism. Offered in odd-numbered years.

242. Paleomagnetism (3) I. Verosub
Lecture—3 hours. Prerequisite: graduate standing. Principles and applications of paleomagnetism. Physical basis of rock and mineral magnetism. Field and laboratory techniques. Instrumentation. Analysis of paleomagnetic data. Statistical methods. Rock magnetic properties. Geological and geophysical applications. Offered in even-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. Physicochemical principles of metamorphic mineral assemblages and methods of interpreting the paragenesis of metamorphic rocks. Offered in even-numbered years.

247. Metamorphic Petrology Seminar (3) II. Day
Seminar—3 hours. Prerequisite: course 245; course 246 recommended. Selected topics in metamorphic petrology (e.g., mass transport processes, tectonic settings, geo-

erometry, thermal structure of metamorphic belts, regional studies). May be repeated for credit when topic is different. Offered in odd-numbered years.

250. Advanced Geochemistry Seminar (3) II. The Staff 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. Physicochemical aspects of the phase relations in silicate systems and their application to the petrogenesis of igneous and metamorphic rocks.

260. Paleontology (3) I, Signor; II, Signor; III, the Staff 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. Offered in even-numbered years.

***269. Evolutionary Biology of Protista** (3) II. 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.

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.

282. Geological X-Ray Spectrometric Analysis (4) III. Schiffman Lecture—3 hours; laboratory—3-4 hours. Prerequisite: course 60, Chemistry 4C, Physics 8D, graduate standing in Geology. Theory of generation and detection of x-rays as applied to analytical chemistry of rocks and minerals. Laboratory sessions on use of the x-ray fluorescence spectrometer, electron microprobe, and x-ray diffractometer.

290. Seminar in Geology (1) I, II, III. The Staff Seminar—1 hour; discussion—1 hour. Presentation and discussion of current topics in geology by visiting lecturers, staff, and students. (S/U grading only.)

291. Geology of the Sierra Nevada (1) III. Day, 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.) Offered in odd-numbered years.

***296. Advanced Problems in Tectonics** (3) I, Moores Seminar—3 hours. Prerequisite: course 108 or consent of instructor. Seminar dealing with current problems in tectonics of selected regions. Topics will change from year to year. Emphasis on study of recent literature. May be repeated for credit. (P/NP grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

German

(College of Letters and Science)

Winder McConnell, Ph.D., Chairperson of the Department

Clifford A. Bernd, Ph.D., Acting Chairperson of the Department (Fall and Winter Quarters)

Department Office (German and Russian), 416 Sproul Hall (752-2114)

Faculty

Wilbur A. Benware, Ph.D., Associate Professor
 Klaus L. Berghahn, Ph.D., Professor
 †Clifford A. Bernd, Ph.D., Professor
 John F. Fetzer, Ph.D., Professor
 Gail Finney, Ph.D., Associate Professor
 Ingeborg Henderson, Ph.D., Lecturer
 †Roland W. Hoermann, Ph.D., Professor
 Anna K. Kuhn, Ph.D., Associate Professor
 Victor Lange, Ph.D., Visiting 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., Lecturer
 Peter M. Schaeffer, Ph.D., Professor

The Major Program

The major explores in depth the literature, language, and culture of the German-speaking world. The program is designed to accommodate both students whose interest lies in literary or linguistic studies, as well as those who wish to obtain a broad-based knowledge of the contributions of the German-speaking world to fields such as music, art, history, philosophy, economics, etc. Accordingly, the Department offers a major with three tracks: (a) Literature; (b) Language; (c) German Area Studies. The Department's primary emphasis on literary periods, movements, and themes is reflected in the solid core of upper division courses in German literature that form an integral component of each track. Completion of the Literature or German Area Studies track will prepare the student for advanced study in German at the graduate level. All three tracks prepare students for career opportunities in fields such as international relations, business, the sciences, and the arts.

German

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	8-23
German 1-2-3 (or the equivalent)	0-15
German 4 or 6A-6B	4
German 51	4
Recommended: Linguistics 1	4
Depth Subject Matter	44
German Literature Emphasis	
German 101, 102	8
German 120	4
Three literature courses chosen from German 121, 122, 123, 126, 132, 133	12
Five additional upper-division literature courses	20
Including one or more courses in Comparative Literature, another national literature, or German literature in translation chosen in consultation with adviser.	
German Area Studies Emphasis	
German 101, 102	8
German 120	4
Three literature courses chosen from German 121, 122, 123, 126, 132, 133	12
History 144	4
Four elective courses in accordance with student's interest	16
Courses chosen from at least two of the following three areas after consultation with and approval by adviser.	
Humanities: History 143, Philosophy 170, 175, 176.	
Social Sciences: Economics 174, Geography 123, Political Science 117, 137.	
Fine Arts: Art 176C, 177A, 177B, Music 110A, 110C, 110D.	
Special consideration also given to such courses in Comparative Literature as the 164 series, where pan-European movements influential upon German literature are at issue.	

German Language Emphasis

German 101, 102	8
Three literature courses chosen from German 121, 122, 123, 126, 132, 133	12
German 120	4
German 104A, 104B	8
Three courses selected from German 105, 106, 107, 108, 109A, 109B	12

Total Units for the Major 44-70

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 109B	18-24
German Literature	18-24
Choose courses numbered from German 101-102, 120 and above	18-24
One lower division course from German 48 to 52 may be counted.	

Major Adviser. F. Sammern.

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 the University and College requirements.

Teaching Credential Subject Representative. I. Henderson. See also under the Teacher Education Program.

The Master of Arts Degree. The Department offers programs of study leading to the M.A. degree under both Plan I (thesis) and Plan II (comprehensive final examination). A minimum of 30 units is required for Plan I, and a minimum of 36 units for Plan II. Further information may be obtained by writing to the Department Chairperson or the Graduate Adviser.

The Degree of Doctor of Philosophy. The Department offers programs of study and research leading to the Ph.D. degree. Detailed information may be obtained by writing to the Department Chairperson or the Graduate Adviser.

Graduate Adviser. J.F. Fetzer.

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 (5) I, II, III. Henderson in charge
 Discussion—5 hours; laboratory—two ½-hour sessions. Introduction to German grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed German 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary German (5) I, II, III. Henderson in charge
 Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 1. Continuation of course 1 in areas of grammar and basic language skills.

3. Elementary German (5) I, II, III. Henderson in charge
 Discussion—5 hours; laboratory—two ½-hour sessions. Prerequisite: course 2. Completion of grammar sequence and continuing practice of all language skills through cultural texts.

4. Intermediary German (4) I, II, III. Henderson in charge
 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 in charge
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 in charge
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) II. 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.

***50. Survey of German Culture** (3) III. Henderson
Lecture—3 hours; term paper. 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. Introduction to Literary Analysis (4) I. Finney
Lecture—3 hours; discussion—1 hour. Knowledge of German not required. Introductory study of various genres of German literature with emphasis on the interrelationship between form and content and the impact on contemporary literary appreciation.

52. Masterworks of German Literature in English Translation (4) I. Fetzer
Lecture—3 hours; papers. Representative masterworks in English translation, beginning with the baroque period of seventeenth century (treating genres such as drama, comedy, novel, novella, fairy tale, lyric poetry) through the modern epoch. Lectures cover background information on periods, authors, and criticism. General Education credit: Civilization and Culture/Introductory.

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 con-

versational 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. Schaeffer
Discussion—3 hours; written reports. Prerequisite: course 102 or the equivalent. Exercises in German/English translation using literary and non-literary texts of different styles and linguistic difficulties.

104B. Advanced Translation (4) II. Schaeffer
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) II. 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. (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. (Same course as Linguistics 106.)

***107. Modern German Syntax** (4) III. Benware
Discussion—3 hours; term paper. Prerequisite: course 102 or the equivalent or consent of instructor; Linguistics 1 recommended. Examination of the major problems in describing modern German sentence structure.

***108. Varieties of Contemporary German** (4) III. Benware
Lecture—3 hours; laboratory and/or individual/group consultation on projects. Prerequisite: courses 102, 105. Study of relations between Standard language, *Umgangssprachen* and dialects. Approach is both descriptive and sociolinguistic. Class or individual projects on regional differences, including all of the contiguous German-speaking area of Europe.

109A. Business German (4) II. Henderson
Lecture-Discussion—4 hours. Prerequisite: course 101 or consent of instructor. Specialized advanced language course using business-oriented information and publications as the basis for discussions, role-play, reports, compositions and translations.

109B. Advanced Business German (3) III. Henderson
Lecture—3 hours. Prerequisite: course 109A or consent of instructor. Specialized advanced language course designed as sequel to German 109A. Expands on previously introduced materials and features new topics of interest such as management, computers, and business law.

***110. Older German Literature in English** (4) I, McConnell
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing or consent of instructor. Knowledge of German not required. Analyses in English of German literature from the Middle Ages through the Reformation (*Nibelungenlied*, Gottfried's *Tristan und Isolde* or Wolfram's *Parzival*, lyric poetry, selections from Johann von Tepl, Conrad Celtis, Sebastian Brant, Erasmus, Luther). General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

***111. Studies of Major Writers from the Seventeenth to the Twentieth Century (in English)** (4) II. The Staff
Lecture—3 hours; discussion—1 hour; Prerequisite: upper division standing or consent of instructor. Knowledge of German not required. 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 vary each time course is offered.

***111G. Studies in Major Writers from the 17th to the 20th Century** (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Principal works by one or more major authors such as Grimmelshausen, Lessing, Schiller, Goethe, Heine, Büchner, Hauptmann, Thomas Mann, Brecht, Kafka. Content will vary each time course offered. Readings, lectures, discussions in German. May be repeated for credit.

112. Special Topics in German Literature (4) II. Menges
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.

***112G. Special Topics in German Literature** (4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 101. Analysis of significant themes in German Literature: women in literature; the image of America; myths, legends, fairytales; war and social unrest; satire and humor. Readings, lectures, and discussions in German. May be repeated for credit.

113. Goethe's *Faust (4) II. Bernd
Discussion—3 hours; term paper. Intensive study of one of the great works of world literature: Parts I and II. Discussions and readings in English; reading the text in the original is encouraged. General Education credit: Civilization and Culture/Non-Introductory.

***114. The Faust Tradition before and after Goethe** (4) II. Fetzer
Lecture—3 hours; term paper. Examines predecessors of Goethe's *Faust* (the German chapbook of 1587, Marlowe's *Tragic History of Dr. Faustus* of 1592), and some successors (Mann's novel of 1947) in order to underscore key variations of this provocative and pervasive theme. Knowledge of German not required.

115A. German Literature since 1945 (4) I, Menges
Lecture—3 hours; written reports—1 hour. Reading of major writers including the post-war generation of Austria, Switzerland and West-Germany. Discussion of novelists like Böll, Grass, Johnson, Walsler, Handke; playwrights such as Frisch, Dürrenmatt and Hochhuth and poets like Celan, Enzensberger and Aichinger. Knowledge of German not required. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 4C.

***115B. German Literature since 1945** (4) II, Schaeffer
Lecture—3 hours; written reports—1 hour. Reading and discussion of the literature of the German Democratic Republic (East Germany), the theory of literature in the socialist world, the practice of this literature as exemplified in such authors as Strittmatter, Seghers, Wolf, Kant, Hacks. Knowledge of German not required.

116. From Goethe's *Werther* to Today's *Werthers* (4) II, Fetzer
Lecture—3 hours; discussion—1 hour; written reports. Prerequisite: course 51 or 52 recommended. Comparison of Germany's first international best-seller, Goethe's *The Sufferings of Young Werther* (1774) with its later counterparts, culminating in Plenzdorf's novel of 1973 *The New Sufferings of Young W.* General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: German 52.

***117A. The Tristan Tradition: Medieval, Musical, Modern** (4) I, Fetzer, McConnell
Lecture—3 hours; term paper. Prerequisite: courses 51, 52, and Music 10 recommended. Three different modes of the Tristan and Isolde legend: the medieval epic poem of Gottfried von Strassburg (1210), the music drama of Wagner (1859) and Thomas Mann's parodistic novella (1903) in their intellectual environment and interrelationship. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 52, Comparative Literature 2, or English 3.

***117B. The Nibelungen Tradition Medieval, Musical and Modern** (4) III, Fetzer, McConnell
Lecture—3 hours; term paper. Prerequisite: course 51 or 52 or Music 10 recommended. Knowledge of German not required. Three modes of the Nibelungen legend: the Medieval epic poem *Nibelungenlied*, the Scandinavian *Volsunga Saga*, Wagner's music drama *Ring of the Nibelungen* and Thomas Mann's *Blood of the Walsungs* in their intellectual environment and interrelationship.

119. From German Fiction to German Film (4) II, Fetzer
Lecture—3 hours; discussion—1 hour; term paper. Examines a number of film adaptations of major German prose works and plays to ascertain the types of changes involved in the shift in medium and the positive and negative effects achieved by such transferences.

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.

***121. The Medieval Period in German Literature** (4) II, 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 romances, epics, and lyric poetry. Readings in modern German. Discussion in German and English.

122. German Literature from Humanism to Baroque (4) I, Schaeffer

Lecture—3 hours; written reports. Prerequisite: course 101. Exemplary literary works of the sixteenth and seventeenth centuries tracing the principal lines of development and showing the reflection in literature of the social scene.

123. Literature of the Classical Age (4) II. Berghahn
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.

125. Short Fiction Around 1900 (4) II. Schaeffer
Lecture—3 hours; term paper. Prerequisite: course 102 or consent of instructor. Representative short German fiction in the fin de siècle period, to attain conversance with various prose styles and the cultural currents they reflect.

126. Modern German Literature (4) 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. May be repeated for credit with consent of Undergraduate Major Adviser.

131. German Lyric Poetry (4) I, Sammern
Lecture—3 hours; term paper. Prerequisite: course 101. Study of the genre of lyric poetry from late Middle Ages through Renaissance, Baroque, Classical, Romantic and Modern periods in correlation with other literary forms and the social climate of each period.

***132. The German Novelle** (4) 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) III. 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.

192. Field Work in German (1-12) I, II, III. Henderson
Internship—3-36 hours. Prerequisite: course 109A. Internship with several German companies. Participation in various business activities where expertise in German is expected and further developed. (P/NP grading only.)

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 German (2-4) I, Henderson
Lecture—2-4 hours; term paper. Prerequisite: course 102 or consent of instructor. Tutoring and leading of special discussion sections in first-year language classes. Offers teaching opportunities under guidance of staff after initial observation period. Exposes course participants to all phases of language teaching; instant feedback and discussion. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

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—202-210, 211, 242, 285-296. These are subdivided into the following areas: (1) Germanic linguistics, (2) literary theory, (3) literature to 1400, (4) literature, 1400-1700, (5) literature, 1700-1785, (6) literature, 1785-1830, (7) literature, 1830-1910, (8) literature, 1910-1933, (9) literature, 1933-1965, (10) literature, 1965-present.

Special—240, 241, 252-261, 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 quarter at least one course from one of the nine general areas and one special course (according to expressed student need).

***202. Middle High German** (4) II. Benware
Seminar—3 hours. Outline of grammar; selections from Middle High German epic and lyric poetry.

***209. Literary Stylistics** (4) I, Schaeffer
Seminar—3 hours; written reports. History and meanings of style; levels of diction; analysis of current literary and critical styles. Practice in writing book reviews, articles, lectures and other papers.

***210. Techniques of Literary Scholarship** (4) I, Fetzer
Seminar—3 hours. The bibliographical, organizational, and methodological tools and resources for advanced, independent research.

211. Concepts in Literary Theory (4) II. Berghahn
Seminar—3 hours; written reports. Advanced course in concepts of literary theory and criticism. Discussion of the emergence of theoretical concepts and their impact on the understanding and appreciation of literary works. Discussion in German and English, readings in German.

***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. The Staff
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.

***252. The Writings 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. Berghahn
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 prose works; special attention will be given to the peculiar hermeneutic problems in modern German, French and Anglo-American Kleist criticism.

***258. The Novels of Thomas Mann** (4) II. Menges
Seminar—3 hours. Reading of selected novels with emphasis on aesthetic techniques, originality, ethical and political values, 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.

***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 Brecht's 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. Required for Ph.D. candidates prior to the Qualifying Examination.

270B. Basic Research for the Dissertation (4) I, II, III. The Staff (Chairperson in charge)

Individual instruction from a faculty member—1 hour. Individually guided intensive research, under the supervision of a faculty member, designed to develop expertise and generate basic materials (such as a detailed outline and bibliography) for the dissertation topic. Required for Ph.D. candidates prior to the Qualifying Examination.

270C. Basic Research for the Dissertation (4) I, II, III. The Staff (Chairperson in charge)

Individual instruction from a faculty member—1 hour. Prerequisite: course 270B. Individually guided intensive research, under the supervision of a faculty member, designed to develop expertise and generate basic materials (such as a detailed outline and bibliography) for the dissertation topic.

Required for Ph.D. candidates prior to the Qualifying Examination.

***285. Middle High German Literature** (4) III. McConnell
Seminar—3 hours; 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) I, Schaeffer
Seminar—3 hours. The "Elegantiadeal" and the varying methods used to portray it in seventeenth-century German literature. May be repeated for credit with consent of instructor.

290. The Enlightenment in German Literature (4) II. Fetzer
Seminar—3 hours. Revolt against the concept of the "Elegantiadeal," and evolution of a new literature based on reason and wit. May be repeated for credit with consent of instructor.

***292. Sentimentality and "Sturm und Drang" in German Literature** (4) III. 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) I, Kuhn
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) I, III. 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 (2) I, Henderson
Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Required of new teaching assistants. (S/U grading only.)

390B. The Teaching of German (2) II. Henderson
Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Required of new teaching assistants. (S/U grading only.)

390C. The Teaching of German (2) III. Henderson
Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Theoretical instruction in modern teaching methods and demonstration of their practical application. Required of new 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)

Roland Marchand, Ph.D., Chairperson of the Department

Department Office, 176 Voorhies Hall (752-0776)

Faculty

Arnold J. Bauer, Ph.D., Professor
 William M. Bowsky, Ph.D., Professor
 Cynthia L. Brantley, Ph.D., Associate Professor
 †David Brody, Ph.D., Professor
 †Daniel R. Brower, Jr., Ph.D., Professor
 Daniel H. Calhoun, Ph.D., Professor
 Robert O. Crummey, Ph.D., Professor
 Manfred P. Fleischer, Ph.D., Professor
 John Freeman, M.A., Visiting Professor (*Political Science*)

Paul Goodman, Ph.D., Professor
 William W. Hagen, Ph.D., Professor
 W. Turrentine Jackson, Ph.D., Professor Emeritus
 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
 Eugene Lunn, Ph.D., Professor
 †C. Roland Marchand, Ph.D., Professor
 †Ted W. Margadant, Ph.D., Professor
 Barbara Metcalf, Ph.D., Professor
 Rollie E. Poppino, Ph.D., Professor
 Don C. Price, Ph.D., Professor
 †Ruth E. Rosen, Ph.D., Associate Professor
 Morton Rothstein, Ph.D., Professor
 †Vicki L. Ruiz, Ph.D., Associate Professor
 Richard N. Schwab, Ph.D., Professor
 Morgan B. Sherwood, Ph.D., Professor
 James H. Shideler, Ph.D., Professor Emeritus
 †Michael Smith, Ph.D., Associate Professor
 †Wilson Smith, Ph.D., Professor
 †Stylianios Spyridakis, Ph.D., Professor
 Clarence E. Walker, Ph.D., 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 8, 9A, 9B, 90A	
c. United States and Latin America: History 17A, 17B, 22, 72A, 72B, 85, 86	
d. Africa: History 15	

Depth Subject Matter—Plan I	40-41
At least six upper division courses from one of the fields of concentration* listed below. Include a two-quarter sequence of courses	24
At least three upper division courses from one of the other fields listed	12
At least one course from the following: History 101, or 102 (in field of concentration), 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
A. Asia and Latin America: History 161B, 163B, 165, 166B, 168, 190C, 193, 194C, 194D, 194E, 195, 196B	
B. United States: History 169B, 174A, 174D, 175C, 176B, 177B, 179, 180C, 185B, 188B, 189C	
C. Europe: History 137C, 138, 141, 142, 143, 144, 147B, 147C, 150, 151D, 155A, 155B, 155C	
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: History 102A, 102B, 102C, 102D, 102E, 102F, 102I, 102P, 111A, 111B, 111C, 121A, 121B, 121C, 122, 130A,

- 130B, 130C, 131A, 131B, 131C, 133, 134A, 134B, 137A, 137B, 137C, 138, 140, 141, 142, 143, 144, 145, 146A, 146B, 147A, 147B, 147C, 148, 149, 150, 151A, 151B, 151C, 151D, 154, 155A, 155B, 155C.
- b. United States History: History 102K, 102L, 102M, 169A, 169B, 170A, 170B, 170C, 171A, 171B, 173A, 173B, 173C, 174A, 174B, 174C, 174D, 175A, 175B, 175C, 176A, 176B, 177A, 177B, 178, 179, 180A, 180B, 180C, 181, 183A, 183B, 185A, 185B, 188A, 188B, 189A, 189B, 189C.
- c. Asian History: History 102G, 102H, 102N, 102Q, 102R, 190A, 190B, 190C, 191A, 191B, 193, 194A, 194B, 194C, 194D, 195, 196A, 196B.
- d. African History: History 102O, 115A, 115B, 115C, 116.
- e. Latin American History: 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. C.L. Brantley, D.H. Calhoun, R.O. Crummey, M.P. Fleischer, D.L. Jacobson, E.H. Kinmonth, N.B. Landau, T.W. Margadant, B. Metcalf, D.C. Price, R.E. Rosen, M. Rothstein, V.L. Ruiz, R.N. Schwab, M.B. Sherwood, M. Smith, S. Spyridakis, C.E. Walker.

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, 142, 143, 144, 147B, 147C, 151D, 161B, 163B, 165, 166B, 168, 169B, 173C, 174C, 175C, 176B, 177B, 179, 180C, 185B, 188B, 189C, 190C, 193, 194C, 195, 196.	
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, 150, 175A, 175B, 175C, 177A, 177B, 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 also the section on the Teacher Education Program.

Waiver Program for Single-Subject Teaching Credential in History. The Department of History offers a program of study for students seeking a secondary teaching credential in history. The program 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 1988, 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. With prior approval of their graduate adviser, graduate students may also apply.

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. Preference is given to applications received by June 30; the final application deadline is November 1.

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, W.M. Bowsky, D.H. Calhoun, P. Goodman, K.C. Liu, E. Lunn, T.W. Margadant.

American History and Institutions. This University requirement can be satisfied by passing any one of the following courses in History: 17A, 17B, 72A, 72B, 170A, 170B, 170C, 171A, 171B, 174A, 174B, 174C, 175A, 175B, 175C, 176A, 176B, 177A, 177B, 179, 180A, 180B, 183A, 183B. The upper division courses may be used only with the consent of the instructor. (See also under University requirements.)

Courses in History

Lower Division Courses

1. The Bible and Ancient History (4) II. 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. General Education credit: Civilization and Culture/Introductory.

4A. History of Western Civilization (4) I, III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Growth of western civilization from late antiquity to the Renaissance. General Education credit: Civilization and Culture/Introductory.

4B. History of Western Civilization (4) I, II. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Development of western civilization from the Renaissance to the Eighteenth Century. General Education credit: Civilization and Culture/Introductory.

4C. History of Western Civilization (4) II, III. The Staff (Chairperson in charge)
Lecture—3 hours; discussion—1 hour. Development of Western Civilization from the Eighteenth Century to the present. General Education credit: Civilization and Culture/Introductory.

8. History of Indian Civilization (4) I. Metcalf
Lecture—3 hours; discussion—1 hour; written reports. Survey of Indian civilization from the rise of cities (ca. 2000 B.C.) to the present, emphasizing themes in religion, social and political organization, and art and literature that reflect cultural interaction and change.

9A. History of East Asian Civilization (4) I, III. The Staff
Lecture—3 hours; discussion—1 hour. Surveys traditional Chinese civilization and its modern transformation. Emphasis is on thought and religion, political and social life, art and literature. Perspectives on contemporary China are provided. General Education credit: Civilization and Culture/Introductory.

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) I. 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). General Education credit: Contemporary Societies/Introductory.

***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, II. The Staff
Lecture—3 hours; discussion—1 hour. Growth of the American people from colonial times through the Civil War. General Education credit: Civilization and Culture/Introductory. (CAN Hist 8)

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. General Education credit: Civilization and Culture/Introductory. (CAN Hist 10)

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. General Education credit: Contemporary Societies/ Non-Introductory. Recommended GE prerequisite: History 4C, 17A, 17B, or Political Science 1.

30. Russian Cultural History (4) III. 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 4B or 4C.

72A. 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 from colonial America until the late nineteenth century emphasizing changes resulting from the secularization, commercialization and industrialization of American society. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 17A.

***72B. Social History of American Women and the Family (4) III.** Rosen

Lecture—3 hours; discussion—1 hour. Social and cultural history of women, sex roles and the family in twentieth-century America, emphasizing female reformers and re-

volutionaries, 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) III.** 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.** The Staff
Lecture-discussion—4 hours; written reports. Reading and discussion of aspects of modern China. 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) III. Landau
Lecture-discussion—4 hours; term paper. Prerequisite: consent of instructor. Study of the history of historical thought and writing, analysis of critical and speculative philosophies of history and evaluation of modes of organization, interpretation and style in historical writing.

102A-R. Undergraduate Proseminar in History (5) I, II, III. The Staff
Seminar—3 hours; term paper. Designed primarily for history majors. Intensive reading, discussion, research and writing in selected topics in the various fields of history: (A) Ancient; (B) Medieval; (C) Renaissance and Reformation; (D) Modern Europe to 1815; (E) Europe since 1815; (F) Russia; (G) China to 1800; (H) China since 1800; (I) Britain; (J) Latin America since 1810; (K) American History to 1787; (L) United States, 1787-1896; (M) United States since 1896; (N) Japan; (O) Africa; (P) Christianity and Culture in Europe, 50-1850; (Q) India; (R) Muslim Societies. May be repeated for credit. Limited enrollment.

103. Topics in Historical Research (4) I, II, III. The Staff (Chairperson in charge)
Discussion—3 hours; individual consultation with instructor; paper. Prerequisite: consent of instructor. Individual research resulting in a research paper on a specific topic in one of various fields of history. May be repeated for credit.

***111A. Ancient History (4) I.** Spyridakis
Lecture—3 hours; discussion or paper (student option). History of ancient empires of Near East and of their historical legacy to Western world.

111B. Ancient History (4) II. Spyridakis
Lecture—3 hours; discussion or paper (student option). Political, cultural and intellectual study of Greek world from Minoan-Mycenaean period to end of Hellenistic Age.

111C. Ancient History (4) III. Spyridakis
Lecture—3 hours; discussion or paper (student option). Development of Rome from earliest times. Rise and fall of the Roman Republic; the Empire to 476 A.D.

115A. History of West Africa (4) 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 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) III.** Brantley
Lecture—3 hours; term paper. Prerequisite: courses 115A and 115B recommended. Themes of African history, such as African states and empires, slave trade, relationship of Egypt to rest of Africa, Bantu origins and migrations, and French policy of Assimilation and Association.

- 121A. Medieval History (4) I.** Bowsky
Lecture-discussion and panel presentations—3 hours. European history from "the fall of the Roman Empire" to the eighth century.
- 121B. Medieval History (4) II.** The Staff
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.
- *122. Selected Themes in Medieval History (4) II.** Bowsky
Lecture—3 hours; term paper. Each offering will focus on single major theme, such as medieval agrarian history, feudalism, the family, medieval Italy, or the Crusades. Readings include original sources in English translation and modern works. May be repeated for credit.
- 130A. Christianity and Culture in Europe: 50-1450 (4) I.** Fleischer
Lecture—3 hours; written report or research paper. A history of the ideas and institutions of Christianity and their impact on the late Roman Empire and medieval Europe in terms of outlook on life, art, politics and economics.
- 130B. Christianity and Culture in Europe: 1450-1600 (4) II.** Fleischer
Lecture—3 hours; written report or research paper. A history of the Lutheran, Zwinglian-Calvinist, Radical, Anglican and Catholic Reformations as foundation stones of a new culture in Europe, with special attention to the interconnections between the revival of antiquity and the different reform movements.
- 130C. Christianity and Culture in Europe: 1600-1850 (4) III.** Fleischer
Lecture—3 hours; written report or research paper. A survey of the intellectual, cultural and political re-orientation of European society in the aftermath of the Wars of Religion. "Secularization" will be discussed in the context of the Enlightenment and Romanticism.
- *131A. Early Modern European History (4) I.** Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B recommended. Western European history from about 1350 to about 1500.
- *131B. Early Modern European History (4) II.** Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B, 131A recommended. Western European history from about 1500 to about 1650.
- *131C. Early Modern European History (4) III.** Fleischer
Lecture—3 hours. Prerequisite: courses 4A, 4B, 131B recommended. Western European history from about 1650 to about 1789.
- 133. The Age of Ideas (4) II.** Schwab
Lecture—3 hours. The Enlightenment and its background in the seventeenth century.
- 134A. The Age of Revolution (4) III.** Schwab
Lecture—3 hours. Ideas and institutions during the French Revolution and the Napoleonic era.
- *134B. The Age of Revolution (4) III.** Schwab
Lecture—3 hours. Ideas and revolution after 1815. Offered in odd-numbered years.
- *137A. Russian History: Kievan, Muscovite, and Petrine (4) I.** Crumme
Lecture—3 hours; term paper. Russian civilization from early times to 1725. Emphasis on the rise of autocracy and the evolution of society and culture.
- 137B. Russian History: The Empire, 1725-1900 (4) II.** Brower
Lecture—3 hours; term paper. Russian civilization from the Petrine reforms to the end of the nineteenth century. Emphasis on the strengthening and reform of the autocracy, the rise of movements for revolutionary change, and the evolution of society and culture.
- 137C. Revolutionary and Soviet Russia, 1900 to the Present (4) III.** Brower
Lecture—3 hours; written reports. Evolution of the Russian state and society from the collapse of tsarist Russia through the creation and consolidation of the new Soviet order.
- 138. History of the Russian Revolution (4) II.** 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History, 3, 4C, or 10.
- *140. The Rise of Capitalism in Europe (4) III.** Hagen
Lecture—3 hours; term paper. Prerequisite: course 4B or 4C. Comparative analysis of major interpretations of the rise of merchant capitalism during Middle Ages and Renaissance; European expansion overseas, 1450-1815; the transition to modern capitalism via industrial revolution. Interplay of social, political, cultural, and economic history. Offered in even-numbered years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 4A, 4B, or 4C.
- *141. France Since 1815 (4) II.** Margadant
Lecture—3 hours; term paper.
- 142. Why the Holocaust? (4) II.** Goodman
Seminar—3 hours; written reports. Long- and short-term causes of the Holocaust; the emancipation of European Jewry; the rise of modern antisemitism; nationality question in central Europe; antisemitism and German politics; Nazism and mass murder; responses by victims and bystanders.
- *143. History of Eastern Europe and the Balkans (4) II.** 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 1648 (4) II.** Hagen
Lecture—3 hours; essays. Social and political history of Germany in the ages of absolutism and the Enlightenment, industrialization and national unification, the World Wars, and since 1945.
- 145. War and Revolution in Europe, 1789-1918 (4) III.** 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) III.** Willis
Lecture—3 hours; term paper. Survey of the history of Europe since 1939.
- 147A. European Intellectual History, 1800-1870 (4) I.** Lunn
Lecture—3 hours; term paper. European thought in the early industrial era. Shifting cultural frameworks, from romanticism to scientism; liberal and socialist reactions to social change. Focus on the work of Goethe, Hegel, J.S. Mill, Marx, Darwin and Flaubert. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 4C or Philosophy 151.
- 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 4C or Philosophy 151.
- 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 4C.
- *148. From Cradle to Coffin: The Life Cycle in Nineteenth-Century Europe (4) II.** The Staff
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.
- *150. Ethnic Conflict and Anti-Semitism in Modern Europe (4) I.** Hagen
Lecture—3 hours; term paper. Prerequisite: course 4C. Historical dynamics of ethnic conflict and radical nationalism in nineteenth- and twentieth-century Europe. Focusing on selected examples (e.g., the Habsburg Empire; the Celtic lands; forms and functions of anti-Semitism; interpretations and consequences of the Holocaust). Offered in even-numbered years.
- 151A. England: The Middle Ages (4) II.** The Staff
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.
- 155A. British Foreign Policy Since 1920: The End of the British Empire (4) I.** Freeman
Lecture—3 hours; term paper. Prerequisite: upper division standing. How and why Britain passed so rapidly and by constitutional process from being the greatest imperial power in history to non-imperial, middle-grade status; the background against which the global responsibilities of the U.S. developed with equal rapidity.
- 155B. British Foreign Policy Since 1920: Britain's Relations with the U.S. and the U.S.S.R. (4) II.** Freeman
Lecture—3 hours; term paper. Prerequisite: upper division standing. Britain's supposedly intimate relation with the U.S.; its modification with changes in power-structure and with Britain's EEC membership; the effect on relations with the U.S. of Britain's (and other NATO powers') efforts to achieve independent relations with the U.S.S.R.
- 155C. British Foreign Policy Since 1920: Britain and Europe (4) III.** Freeman
Lecture—3 hours; term paper. Prerequisite: upper division standing. Britain's attempts after 1920 to replace the European balance of power with collective security and then, briefly after World War II, with British hegemony in Europe. Britain's final, contentious entry to the EEC and its consequences for western Europe.
- 161A. Latin American History (4) I.** Bauer
Lecture-discussion—3 hours; written reports. Pre-Columbian civilization of Middle America and the Andean region (mainly Aztec and Inca); the impact of European conquest and colonization; the formation of a hybrid culture. Extensive use of photographic slides.
- 161B. Latin American History (4) II.** Bauer
Lecture-discussion—3 hours; written reports. Evolution of modern Latin America: export economies; oligarchic rule; reform and revolution; the difficulties of the twentieth century. Emphasis on Mexico, Cuba, the Andean region, Chile, and Argentina. Photographic slides.
- *162. History of the Andean Region (4) III.** Bauer
Lecture-discussion—3 hours; written and/or oral reports. History of the Andean region, the area that now comprises modern Peru, Bolivia, and Chile, from the beginning of human settlement to the present.
- 163A. History of Brazil (4) 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 selected Latin American nations; similarities and differences in cause, course, and consequence. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: History 4C, 17B, or Political Science 2.
- *166A. History of Mexico to 1848 (4) III.** Bauer
Lecture-discussion—3 hours; written and/or oral reports. Political, economic, and social development of pre-Columbian, colonial and national Mexico to 1848. Offered in even-numbered years.
- *166B. History of Mexico Since 1848 (4) III.** The Staff
Lecture-discussion—3 hours; written and/or oral reports. History of Mexico from 1848 to the present. Offered in odd-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. Ruiz
Lecture-discussion—3 hours; written and/or oral reports. Economic, social, religious, cultural and political development of the Spanish-speaking population of the Southwestern United States from about 1800 to 1910. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 17A or 17B.

***169B. Mexican-American History (4) II.** The Staff
Lecture-discussion—3 hours; written and/or oral reports. Role of the Mexican and Mexican-American or Chicano in the economy, politics, religion, culture and society of the Southwestern United States since 1910. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 17B.

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) I. 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).

***173A. North America: Early Imperial Wars (4) II.** Calhoun
Lecture—3 hours; paper with scheduled consultation. European conquests, Native American resistance, early colonial protest actions and rebellions. Tactical styles of various peoples, conditions of effectiveness and failure, and the relation of strategy to social development and conflict. Offered in even-numbered years.

173B. North America: Wars of National Expansion and Conservative Resistance (4) I. Calhoun
Lecture—3 hours; paper with scheduled consultation. Later wars of colonial independence, including War of 1812. Maroon and Native American resistance. Rural and urban guerrillas. Campaigns to assert or resist national unity, including U.S. wars with Mexico and Confederacy. Military reconstruction and reform. Offered in odd-numbered years.

173C. North America: Later Imperial Wars (4) III. Calhoun
Lecture—3 hours; paper with scheduled consultation. Military conflict and planning on the North American continent and adjacent islands, from the Spanish-American War to the present. Overt conflict aspects of internal protest, and military aspects of internal security operations.

174A. The Emergence of Modern America, 1876-1914 (4) I. Marchand
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. Brody
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. Marchand
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.** W. Smith
Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: course 17A or the equivalent; or course in philosophy since the Renaissance, political theory, American literature, or sociological theory. American thought from the Puritans through the era of the American Enlightenment. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 4B or Philosophy 23.

***175B. Intellectual History of the United States (4) II.** W. Smith
Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: courses 17A and 17B or the equivalent; or course in philosophy since the Renaissance, political theory, American literature, or sociological theory. Nineteenth-century American thought from the 1820s to about 1900, emphasizing Transcendentalism, Jacksonian democratic thought, the impact of Darwinism, and pragmatism.

175C. Intellectual History of the United States (4) III. W. Smith
Lecture—3 hours; oral or written reports on reading; panel discussion preparation. Prerequisite: courses 17A and 17B or the equivalent; or a course in modern political theory, philosophy, American literature, or sociological theory. Twentieth-century American thought from about 1900 to the 1960s, emphasizing pragmatic liberalism, naturalism in law and literature, protestant liberalism and neo-orthodoxy, Freudian currents in social thought and social criticism of the 1960s.

***176A. Social and Cultural History of the United States (4) II.** Marchand
Lecture-discussion—3 hours; term paper. Study of social and cultural forces in American society from colonial times through the Civil War with emphasis on social structure, immigration and nativism, racial and occupational groups, social reform movements and changes in social values.

***176B. Social and Cultural History of the United States (4) III.** Rosen
Lecture-discussion—3 hours; term paper and written or oral report. Study of social and cultural forces in American society since the Civil War with emphasis on social structure, immigration, urbanization, labor organizations, racial and national groups, social reform movements and changes in social values.

177A. History of Black People and American Race Relations (4) I. Walker
Lecture—3 hours; term papers. Prerequisite: course 17A or 17B. Afro-American history. History of black people in the United States from African background to Reconstruction. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 17A or 17B.

177B. History of Black People and American Race Relations (4) II. Walker
Lecture—3 hours; term papers. Prerequisite: course 17A or 17B. Afro-American history. History of black people in the United States from Reconstruction to the present. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 17A or 17B.

***178. American Colleges and Universities (4) III.** W. 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, III. 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.

181. Religion in American History to 1900 (4) III. Jacobson
Lecture—2 hours; discussion—1 hour; oral and written reports. Religious ideas and institutions from the Puritans to about 1900. Survey of the large-scale social changes as-

sociated with revivalism and the great awakenings and the movement from Protestant orthodoxy to pluralism in industrial America.

***183A. The Frontier Experience: Trans-Mississippi West (4) III.** The Staff
Lecture—3 hours; written and/or oral reports. The fur trade, western exploration and transportation, the Oregon Country, the Greater Southwest and the Mexican War, the Mormons, mining discovery, and the West during the Civil War.

***183B. The Frontier Experience: Trans-Mississippi West (4) II.** M. Smith
Lecture—3 hours; written and/or oral reports. Spread of the mining kingdom, the range cattle industry, Indian-military affairs, settlement of the Great Plains and Rocky Mountain Regions and political organization of the West.

185A. History of Science in America (4) II. Sherwood
Lecture—3 hours; research paper. Survey of the European background. Study of American scientific institutions, ideas, personalities, creative processes in science, and of relationships between society and science from colonial times to present.

***185B. History of Technology in America (4) III.** Sherwood
Lecture—3 hours; research paper. Study of American technology, emphasizing biographical approach to 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 U.S. to 1900 (4) II.** Rothstein
Lecture—3 hours; term paper. Agricultural settlement and development in the U.S., with emphasis on government policies, economic and social institutions. Offered in even-numbered years.

***188B. History of Agriculture in the U.S. since 1900 (4) III.** Rothstein
Lecture—3 hours; term paper. Agricultural settlement and development in the U.S. with emphasis on government policy, economic and social institutions. Offered in even-numbered years.

***189A. History of California (4) I.** M. Smith
Lecture—3 hours; written and/or oral reports. Spanish exploration and settlement; the mission as a frontier institution; revolt of the Californios; penetration by Mountain Men; pioneer trails and settlement; Bear Flag Revolt and Mexican War.

189B. History of California (4) I. M. Smith
Lecture—3 hours; written and/or oral reports. State constitution; land grant and Indian policies; Gold Rush; vigilantes; railroad construction; the wheat era; changing economy; social and literary developments; Progressive reform.

189C. History of California (4) II. M. Smith
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) II. Liu
Lecture—2 hours; discussion—1 hour; term paper. Patterns and problems of Chinese life traced through the Ming and Ch'ing dynasties. Readings include literary materials in English translation (particularly novels) which reflect the social and intellectual scene, the elite ethos as well as popular culture. Offered in even-numbered years.

***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) I, 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) III. 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) II.** 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. 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. 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.

196A. Medieval India (4) I. Metcalf

Lecture—3 hours; discussion—1 hour; written reports. Survey of history of India in the Millennium preceding arrival of British in the eighteenth century, focusing on interaction of the civilizations of Hinduism and Islam and on the changing nature of the state.

196B. Modern India (4) II. Metcalf

Lecture—3 hours; discussion—1 hour. Survey of cultural, social, economic, and political aspects of South Asian history from arrival of the British in the eighteenth century to formation of new independent states—India, Bangladesh, and Pakistan—in the twentieth century.

197T. Tutoring in History (2) 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-N. 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; (E) Europe since 1815; (F) China to 1890; (G) China since 1890; (H) Britain; (I) Latin America since 1810; (J) American History to 1787; (K) United States, 1787-1896; (L) United States since 1896; (N) Modern Japan. May be repeated for credit when different subject area is studied.

203. Seminar Research (4) I, II, III. The Staff (Chairperson in charge)

Seminar—3 hours. Prerequisite: consent of instructor. Designed primarily for students preparing for higher degrees in History. Individual research and analysis resulting in substantial research paper. May be repeated for credit.

204A. Historiography (4) II. The Staff (Chairperson in charge)

Seminar—3 hours; research paper. Prerequisite: consent of instructor for non-History graduate students. Introduction to major works of historical scholarship from the Greeks to the present.

204B. New Methods of Historical Research (4) III. 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) I, 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.

***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) II. W. 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.**

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 two-course sequence.)

***278B. Seminar: Topics in Afro-American History (4) II.**

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 two-course 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 (2) I, II, III. The Staff

Discussion—2 hours. Designed for teaching assistants with emphasis on problems and procedures encountered by teachers of lower division classes at the university. (S/U grading only.)

History of Art

See Art

Home Economics

(College of Agricultural and Environmental Sciences)

Program of Study

If you have declared Home Economics as your major or have begun coursework for the major as an enrolled student before Spring Quarter 1987, you may complete a B.S. degree by following the major requirements as listed in a prior edition of this catalog.

Students who are interested in the field of home economics have several options available to them on the Davis campus. The following major programs

will allow the student to pursue similar academic goals with a specific major area of emphasis: Agrarian Studies, Agricultural Education, Agricultural and Managerial Economics, Community Nutrition, Consumer Food Science, Design, Dietetics, Food Science, Human Development, and Textiles and Clothing.

In addition, you may enroll in the College of Agricultural and Environmental Sciences' Exploratory Program to define your academic goals and identify an appropriate major program. The College also offers an Individual major whereby you can design an academic program which best suits your individual goals and objectives.

Courses in Home Economics

Lower Division Courses

90. Challenges and Opportunities in Home Economics (1) III. Schutz 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 odd-numbered years.

92. Internship in Home Economics (1-12) I, II, III. The Staff (Schutz 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 (Schutz 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 (Schutz in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Schutz in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Home Economics Education

See Agricultural and Home Economics Education

Horticulture (A Graduate Group)

Vito S. Polito, 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 Courses

251. Modeling Horticultural Systems (3) II. Lieth
Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 101, calculus, or consent of instructor. Introduces students to systems modeling. Primary emphasis on physiological and ecological models with examples drawn from areas of interest to class participants. Applications to horticultural systems will be explored. Students will receive hands-on experience.

290. Seminar (1) I, II, III. The Staff
Seminar—1 hour. Prerequisite: graduate standing at UCD. Seminars presented by invited speakers, students, or faculty on selected topics in horticulture. (S/U grading only.)

Human 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	39-44
Anthropology 1 and 2	8
Anthropology 15	5
Biology (Biological Sciences 1 or 10)	4-5
Genetics (Genetics 10, 100)	4
Nutrition 10 or 101	3-5
Physiology (Physiology 2, 10, 110)	4-5
Psychology 1 or 15	3-4

Statistics	4
Human Development 30	4
Depth Subject Matter	49-52
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 140-140L, 141, 142)	4
Four additional upper division Human Development courses, or related courses from list of restricted electives as determined in consultation with faculty adviser	14-16
Breadth Subject Matter	19-20
English or rhetoric, to include at least one upper division course (see College requirement) ..	11-12
American history/American government (political science)	8
Unrestricted Electives	64-73
Total Units for the Major	180

Major Adviser. L.V. Harper.

Related Major Program. See the major in Applied Behavioral Sciences.

Minor Program Requirements:

Human Development	20
Human Development 100A	4
Human Development 100B or 100C	4
Human Development 110 or 103 or 151	4
Two courses from Human Development 101, 102, 130, 131, or 132	8

Minor Adviser. L.V. Harper.

Graduate Study. Refer to the Graduate Division section in this catalog.

Courses in Human Development

Questions pertaining to the following courses should be directed to the instructor or to the Applied Behavioral Sciences Advising Office, 101 Academic Office Building-4 (752-2244).

Lower Division Courses

12. Human Sexuality (2) I, II, III. Golanty
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—4 hours. Prerequisite: Psychology 1 or 15 and 16. Scope and methods of human development focusing on aspects of socialization in families throughout life cycle; considering impacts of alcoholism and abuse on socialization; exploring sources of strength and help. Not open for credit to students who have completed courses 100A, 100B or 110. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Psychology 15-16.

30. Observation Techniques in Human Development (4) I, III. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: Psychology 1 and consent of instructor. Observational techniques used in the study of human behavior and development, with focus on ages six months to 5 years; analysis and use of observational data.

***30B. Observational Techniques and Case Study of A Young Child (1) I, II, III.** Staff
Seminar—1 hour. Prerequisite: course 30A. Observational techniques. Intensive case study of individual child aged six months to 5 years; analysis and use of observational data. (Deferred grading only, pending completion of 30A-30B sequence.) (Course 30B is being phased out.)

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

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

- 100A. Infancy and Early Childhood** (4) I, Welker
Lecture—4 hours. 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: courses Psychology 1 or 15. Biological, cognitive and social psychological aspects of adult development.
- 101. Cognitive Development** (4) I, The Staff
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, The Staff
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) III, 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) II, The Staff
Lecture—2 hours; discussion—2 hours. Prerequisite: courses 100A-100B or the equivalent; elementary statistics. Research in selected areas of human development (i.e., infancy, learning, cognition, socialization, personality).
- 121. Psychological Assessment** (4) I, 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) I, 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) III, Pollitt
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. Individual Differences in Giftedness** (4) III, Barton
Lecture—3 hours; discussion—1 hour. Prerequisite: courses 100A-100B or consent of instructor. Conceptualization, identification and education of the intelligent, the creative, and the talented, gifted individual.
- 140. Communication and Interaction with Young Children** (2) I, II, III, The Staff
Lecture—2 hours. Prerequisite: courses 30A, 140L (may be taken concurrently), and 100A recommended. Theory and practice in the area of effective interaction with young children. Humanistic, child-centered approaches; awareness of goals, beliefs, and values as these affect interactions.
- 140L. Laboratory in Early Childhood** (3-6) I, II, III, The Staff
Discussion—1-3 hours; laboratory—6-12 hours. Prerequisite: course 140 (may be taken concurrently). Application of theories of learning and development to interaction with children six months to 5 years at Early Childhood Laboratory. Applied skills in communication, discipline and curriculum. May be repeated for credit for a total of 12 units.
- 141. Field Studies with Children and Adolescents** (4-6) II, 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) I, Bryant
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) III, Welker

Lecture—40 hours total. Prerequisite: course 140 or prior experience in an early childhood education program. History of early childhood programs in California; federal, state and local regulations. Implications of different regulations for; funds and budgets; policy making mechanisms; professional and legal responsibilities; staff development; and professional attitudes and issues. Offered in 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.)

192. Internship (1-12) I, II, III, The Staff (Chairperson in charge)

Field placement—3-36 hours. Prerequisite: upper division standing and consent of instructor. Supervised internship off and on campus, in community, and institutional settings. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, The Staff (Chairperson in charge)

(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

200A. Early Development (4) I, Pollitt

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing; basic biology/physiology; one upper division course in Psychology or a related field; one upper division or graduate course in Developmental Psychology (may be taken concurrently). Theory and research on the biological, social, cognitive, and cultural aspects of development from conception to the age of five years.

200B. Middle Childhood and Adolescence (4) II, Bryant, Harper

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing; basic biology or physiology, and at least two upper division- or graduate-level courses in psychology or related fields. Theory and research on biological, cognitive social and cultural influences on behavioral development from age five years until late adolescence.

200C. Development in Adulthood (4) III, Hawkes, Werner

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing; basic biology or physiology; two upper-division or graduate-level courses in psychology or the equivalent. Theory and research on the biological, cognitive, social and cultural aspects of behavioral development from young adulthood to death.

***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.

***203. Development in Middle Childhood** (3) II, Bryant

Seminar—3 hours. Prerequisite: graduate standing; some background in developmental psychology or human development; consent of instructor. Critical evaluation of current theory and research regarding normal and "abnormal" development in middle childhood. Emphasizes social-emotional development in varying contexts (family, school, neighborhood) and considers the interplay of cognitive, biological, social, and emotional processes during middle childhood. Offered in even-numbered years.

210. Theories of Behavioral Development (3) III, The Staff

Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing in behavioral sciences. Consideration of enduring issues in theories of behavioral development; analysis of adequacy of major theoretical schools (e.g., social learning, Piagetian) as scientific theories. Offered in 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) III, 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 sub-cultures in U.S.A.). Offered in odd-numbered years.

***217. Development of Cortical and Perceptual Laterality** (3) I, Kraft

Seminar—3 hours. Prerequisite: graduate standing in child 78 human development or consent of instructor. Current theory and research regarding the development of human cortical and perceptual laterality—emphasizing the relationship of this development to thinking and behavior. Offered in odd-numbered years.

220. Research Methods in Human Growth and Development (3) III,

Lecture—3 hours. Prerequisite: Statistics 13 or the equivalent and at least two upper division courses in human biology or developmental psychology. Theory and research methods in biological growth, and cognitive and social/emotional development from prenatal period to death.

221. Psychological Assessment of Children (4) III, Barton

Lecture—2 hours; discussion—2 hours. Prerequisite: course 121 or consent of instructor. Study of children's behavior through examination, analysis and evaluation of perceptual-motor, cognitive, affective and social development. Problems in assessment of exceptional children considered. Assignments focus on preparation of a comprehensive report on one child.

225. Behavioral Development and Food Intake (4) III, Pollitt

Lecture—3 hours; discussion—1 hour. Prerequisite: graduate standing in Human Development (and related fields) and Nutrition. Multidisciplinary view covering key theoretical and

***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** (3) II, Bryant

Lecture—1 hour; discussion—1 hour; laboratory—3 hours. Prerequisite: graduate standing; supervised field experience with children (e.g., course 140, 141, 142, may be taken concurrently); and consent of instructor. Analysis and application of theories and approaches of consultation and child development to facilitate delivery of child-related services (e.g., educational and mental health). Develop working knowledge of consultation skills for working with adults directly interacting with children and adolescents. Offered in odd-numbered years.

***290. Seminar** (3) I, II, III, The Staff

Seminar—3 hours. Discussion and evaluation of theories, research, and issues in human development. Different topics each quarter.

290C. Research Conference (1) I, II, III, The Staff

Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Supervising instructors lead research discussions with their graduate students. Research papers are reviewed and project proposals are presented and evaluated. May be repeated for credit. (S/U grading only.)

291. Research Issues in Human Development (3) I, II, III, The Staff

Lecture—3 hours. Prerequisite: graduate standing in the behavioral sciences. In-depth presentations of research issues in particular areas of behavioral development.

298. Group Study (1-5) I, II, III, The Staff (Chairperson in charge)

299. Research (1-12) I, II, III, The Staff (Chairperson in charge) (S/U grading only.)

Humanities

(College of Letters and Science)
 James J. Murphy, Ph.D., Program Director
 Program Office, 922 Sproul Hall (752-1219)

Committee in Charge

Ingeborg Henderson, Ph.D., (*German*)
 Robert H. Hopkins, Ph.D. (*English*)
 Earl H. Kinmonth, Ph.D. (*History*)
 James J. Murphy, Ph.D. (*Rhetoric and
 Communication, English*), Chairperson
 Lynn E. Roller, Ph.D. (*Classics*)

The Program of Study

Courses in the Humanities Program are designed to provide instruction in interdisciplinary areas which do not fit readily into existing departments or programs.

Courses in Humanities

Lower Division Course

40. Introduction to Computing in the Humanities (4) II. Roddy
 Lecture—3 hours; laboratory—3 hours. Survey of current approaches to use of computers in such fields as language, literature, history, art, music, and drama. Laboratory in text creation and analysis.

Upper Division Courses

140. Advanced Computing in the Humanities (4) III. Roddy
 Lecture—3 hours; laboratory—3 hours; research project. Prerequisite: course 40 or consent of instructor. The computer as support for the humanities. Topics include advanced textual analysis, editing, vocabulary control, and data base management (design, application and evaluation, and search strategies).

180. Topics in the Humanities (4) I, II, III. The Staff
 Lecture-discussion—4 hours; term paper. Analysis of interdisciplinary issues in the humanities. Topics will vary. May be repeated once for credit.

198. Directed Group Study (1-4) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-4) I, II, III. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

Immunology (A Graduate Group)

M. Eric Gershwin, M.D., Chairperson of the Group

Group Office, 3146 Medical Sciences-1A
 (752-3392)

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, zoology or botany, general bacteriology or microbiology, general genetics, mathematics, general physics, chemistry, and biochemistry.

For work leading to the Ph.D. degree, the requirements include cell biology, chemical immunology, cellular immunology, immunohematology, and advanced immunology. In addition to these general

requirements more specialized preparation in at least one of the following is required: (a) microbiological specialties (bacteriology, virology, parasitology, medical microbiology); (b) zoological specialties (cell biology, endocrinology, embryology, protozoology, histology, cytology, physiology); (c) medical specialties (pathology, anatomy, pharmacology, clinical pathology, reproduction, hematology, epidemiology); (d) biochemistry/biophysics specialties (biologically active molecules, control mechanisms); (e) genetic specialties (developmental genetics, population genetics, cytogenetics, molecular genetics).

Graduate Adviser. Contact the Group Office.

Courses in Immunology

Graduate Course

291. Investigative Immunology (1) I, II, III. The Staff (Gershwin in charge)
 Seminar—3 hours. Prerequisite: graduate standing. Presentation, discussion, and analysis of topics in immunological research. (S/U grading only.)

Individual Major

(Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science)

The Major Program

The Individual Major, an integrated program composed of courses from two or more disciplines, is designed by the student and is subject to approval by faculty advisers and appropriate college committees. This major enables a student to pursue a specific interest which cannot be accommodated within the framework of an existing major. It must clearly and specifically meet the student's educational goals and provide, where appropriate, a basis for the applicant's career objectives as well as meet University and College academic standards.

Proposals for individual majors should 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 (variable)	
Lower division courses basic to the program or needed to satisfy prerequisites for upper division requirements.	
Depth Subject Matter 45	
An individualized program of 45 upper division units taken from two or more areas of study. At least 30 of the 45 units must be taken from courses provided by the College.	
Unrestricted Electives (variable)	
Total Units for the Degree	180

Additional requirements

At least 54 of the 180 units needed for graduation must be upper division. The College also requires satisfaction of the General Education Requirement and not less than 7 units in English and/or Rhetoric and Communication courses that

emphasize written or oral expression (see College requirement).

Master Adviser. C.L. Keen (*Nutrition*). The course of study must be developed in consultation with the Master Adviser, and two or more faculty members prior to final review by the Individual Major Committee for the College.

Incoming transfer students applying for an Individual Major will be admitted into the Exploratory Program.

College of 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 and Communication 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 College of Engineering degree requirements.)

College of Letters and Science

Program Office, 150 Mrak Hall (Dean's Office),
 (752-0392)

Committee in Charge

Don P. Abbott, Ph.D., (*Rhetoric and
 Communication*), (*Spring Quarter*)
 Wesley O. Johnson, Ph.D. (*Statistics*)
 William E. Kleb, D.F.A. (*Dramatic Art*), (*Fall,
 Winter Quarters*)
 Jay Mechling, Ph.D. (*American Studies*),
 Chairperson
 Arnold J. Sillman, Ph.D. (*Animal Physiology*)
 Marian B. Ury, Ph.D. (*Comparative Literature*)

A.B. and B.S. Major Requirements:

	UNITS
Preparatory Subject Matter (variable)	
Lower division courses basic to the program or needed to satisfy prerequisites for upper division requirements.	
Depth Subject Matter 45-54	
Upper division units must include:	
a. interrelated and complementary courses from two or more departments which provide a unified pattern and focus;	

- b. at least 30 units from Letters and Science teaching departments or programs;
- c. no more than 10 units in courses numbered 194H, 198 and 199.

Total Units for Degree 180

Student Proposal. A student submits to the Dean's Office a major proposal and an essay, discussing educational purposes, personal and/or professional objectives, along with faculty letters of recommendation. After initial review, the Faculty Committee on Individual Majors evaluates the proposal and provides final action.

Major Advisers (selected by student). *Principal Adviser:* a faculty member in a teaching department or program in the College of Letters and Science in major field of emphasis. *Secondary Adviser:* a faculty member from secondary area of interest.

Honors Program. Toward the end of the junior year, students potentially eligible for highest honors at graduation (see College section), may petition the Individual Majors Committee for tentative acceptance into an honors program.

Final admission will depend upon the Committee's approval of a senior thesis prospectus that has been agreed upon by the student and faculty adviser. The prospectus must be presented to the Committee during the first quarter of the senior year. Graduation with 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)

Nora A. McGuinness, Ph.D., 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*)
Neal W. Gilbert, Ph.D., Professor Emeritus
Philosophy
Kenneth R. Greider, Ph.D. (*Physics*)
Bruce M. Hackett, Ph.D. (*Sociology*)
Kurt Kreith, Ph.D., (*Mathematics*)
Arthur E. McGuinness, Ph.D. (*English*),
Chairperson
Nora A. McGuinness, Ph.D. (*Integrated Studies*)
David A. Robertson, Ph.D. (*English*)
Eric Schroeder, Ph.D., Lecturer (*English*)
Daniel L. Wick, Ph.D. (*Integrated Studies*)

Faculty

Richard D. Cramer, M.F.A., Professor Emeritus
(*Art*)
Vincent A. Crockenberg, Ph.D., Lecturer
(*Education*)
Gordon J. Edlin, Ph.D., Professor (*Genetics*)
Kenneth R. Greider, Ph.D., Professor (*Physics*)
Bruce M. Hackett, Ph.D., Associate Professor
(*Sociology*)
Arthur E. McGuinness, Ph.D., Professor (*English*)
Nora A. McGuinness, Ph.D., Lecturer
T. Reid, Ph.D., Professor in Residence
(*Ophthalmology*)
Lynn E. Roller, Ph.D., Associate Professor
(*Classics*)
Eric Schroeder, Ph.D., Lecturer (*English*)
Daniel L. Wick, Ph.D., Lecturer

The Program of Study

Integrated Studies is a freshman Honors residential program which introduces students to a variety of

disciplines in humanities, natural sciences, and social sciences. The program encourages cross-disciplinary interests in its faculty and students. It values close contact between student and professor both in the classroom and in the residence hall. Integrated Studies offers an intelligent model for the fulfillment of the college breadth requirements as its courses count toward the completion of requirements in all three undergraduate colleges. Many of its courses have been approved for fulfillment of the campus General Education requirement. 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 in at least three Integrated Studies courses during the year, as well as in the Integrated Studies Seminar. Students not admitted to the Program may not enroll for Integrated Studies courses.

Courses in Integrated Studies**Lower Division Courses**

1A. Nature and the Environment: Physics (4) I, Greider
Lecture-discussion—4 hours. Introductory course on the history, philosophy and methodology of physics from 600 B.C. to the present day. Changes in ideas about the physical universe explored. Problem solving not emphasized. General Education credit: Nature and Environment/Introductory.

1B. Nature and the Environment: Origins of the Universe (4) II, Edlin
Lecture—3 hours; discussion—1 hour. Knowledge of origins of the universe, of matter, of galaxies, stars, and planets, and of the earth and the variety of life forms that have evolved on this planet. General Education credit: Nature and Environment/Introductory.

***2A. Civilization and Culture: Mathematics and Civilization** (4) I, Kreith
Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra and geometry. Topics from arithmetic, geometry, algebra and probability presented in historical context which is designed to convey an appreciation of the role that mathematics has played in shaping our world and civilization.

***2B. Civilization and Culture: Theology** (4) I, Robertson
Discussion—4 hours. Major issues in theology, including the existence and nature of God, the nature and destiny of the human species, free will, and morality from both a western and eastern perspective. General Education credit: Civilization and Culture/Introductory.

2C. Civilization and Culture: Origins of Western Civilization (4) III, Roller
Lecture—3 hours; discussion—1 hour. Civilizations of the ancient Near East and Greece: the problem of divine-human relations, problems of law and justice, and development of science and of logical thought. Readings include selections from Near Eastern texts and from Greek literature.

2D. Civilization and Culture: Literature and Writing (4) I, N. McGuinness
Lecture—3 hours; small-group writing workshop. Prerequisite: completion of Subject A requirement. Exposure to basic methods of literary analysis in drama, fiction and poetry and concepts that guide literary scholars in making critical judgments. Formal writing training. General Education credit: Civilization and Culture/Introductory.

***2E. Civilization and Culture: Playing Shakespeare** (4) I, Stambusky (Dramatic Art)
Lecture—3 hours; laboratory—2 hours. Prerequisite: completion of Subject A requirement. Shakespeare as a theatre professional: producer, actor, director. His use and development of Elizabethan theatre acting space. Objective analysis of how Shakespeare's text actually works on stage. Scene exercises to illustrate effective playing of the text.

***3A. Contemporary Societies: History in Our Time** (4) II, Brower
Lecture—4 hours. The Western World since the second World War covering the Cold War, European recovery and the emergence of Socialist democracies, the spread of Communist regimes in Eastern Europe and their relations with the USSR, and the detente of the 70's. General Education credit: Contemporary Societies/Introductory.

***3B. Society Through Literature: Modern Europe** (4) I, Wick
Lecture—3 hours; discussion—1 hour. Readings and discussion concerning European experience as related to the Russian revolution, two world wars, the rise of Fascism, Nazi holocaust, and the decline of Europe as the center of world politics. General Education credit: Civilization and Culture/Introductory.

***3C. Society Through Literature: Modern China** (4) II, Gibbs (Anthropology)
Lecture—3 hours; discussion—1 hour. China's twentieth-century experience: national humiliation, invasion, isolation,

oppression, and the overthrow of ancient values, as reflected in short stories, novels, poetry, and film. General Education credit: Civilization and Culture/Introductory.

3E. Contemporary Societies: Sociology (4) III, Hackett
Lecture—2 hours; discussion—2 hours. Introduction to modern sociological research and theory utilizing material drawn from three topical areas: the development of gender identities, the social production of scientific and other forms of knowledge, and the social basis of religious belief.

8. Colloquium (1) I, II, III, The Staff (N. McGuinness in charge)
Discussion—1 hour. Lectures, films, and readings on the interrelation between the arts and sciences. May be repeated for credit. (P/NP grading only.)

8A. Special Topics in Natural Science and Mathematics (4) II, III, The Staff
Lecture—3 hours; discussion—1 hour. Group study of a special topic in Natural Sciences and Mathematics. Course varies with topic offered. Limited enrollment. May be repeated for credit.

8B. Special Topics in Humanities (4) II, III, The Staff
Lecture—3 hours; discussion—1 hour. Group study of a special topic in Humanities. Course varies with topic offered. Limited enrollment. May be repeated for credit.

8C. Special Topics in the Social Sciences (4) II, III, The Staff
Lecture—3 hours; discussion—1 hour. Group study of a special topic in Social Sciences. Course varies with topic offered. Limited enrollment. May be repeated for credit.

9. Seminar (1) I, II, III, The Staff (N. McGuinness in charge)
Lecture—1 hour. Lectures, films, and readings on the themes for the year. May be repeated for credit. (P/NP grading only.)

Internal Medicine

See Medicine

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 over seas.

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	49-51
(Choose either Social Sciences or Natural and Physical Sciences core)	
Social Sciences core	
Physical science (Chemistry 1A, 1B)	10
Mathematics (Computer Science Engineering 10, Agricultural Science and Management 150)	7
Biological science (Biological Sciences 1, Plant Science 2, Animal Science 1, Nutrition 10, Botany 2, Zoology 2, Soil Science 10)	12-13
English (see College requirement)	8
Social sciences (Applied Behavioral Sciences 1, 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 6A)	4
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, Microbiology 2 and 3, Genetics 100)	15
English (see College requirement)	8
Depth Subject Matter	39-40
International Agricultural Development 10, 110A, 110B	9
International agricultural development (International Agricultural Development 101, 102, 103, 141, 190, 191, 195, 198)	12
Agricultural economics and economics, Economics 1A-1B and two upper division courses relevant to development (Agricultural Economics 100A, 100B, 106, 113 or 136, 157, 140, 145, 150, 176; Economics 100, 100M, 110A, 115A, 115B, 118)	18
Primary Field of Specialization†	60
<i>Natural Sciences or Social Sciences:</i> Courses chosen by student, with an adviser in that specialization, to include additional preparation required for a particular specialization, depth subject matter, and supporting disciplines.	
<i>Natural Sciences:</i> Student should include some coursework in social sciences appropriate to the geographic area of personal interest (e.g., anthropology, geography, history, or political science area studies courses).	
Unrestricted Electives	29-32
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. S. B. Brush (*Applied Behavioral Sciences*).

Minor Program Requirements:

	UNITS
International Agricultural Development	20
International Agricultural Development 10, 101, 102, 103, 110A, 110B	16
Minimum of four units chosen from International Agricultural Development 141, 190, 195,	

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

Economics 115A-115B, Vegetable Crops 150, Agronomy 100, 110L, 111

Minor Adviser. S. B. Brush (139 Academic Office Building-4).

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. S.B. Brush, (*Applied Behavioral Sciences*); D.J. Boyd (*Anthropology*); K.G. Cassman and I.W. Buddenhagen (*Agronomy and Range Science*); L.S. Jarvis (*Agricultural Economics*).

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; 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. Introduction to International Agricultural Development (3) II. Brush

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; agricultural contributions to development. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Economics 1A-1B or Anthropology 2.

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

101. Tropical Crop Agriculture (4) II. Buddenhagen (Agronomy and Range Science)

Lecture—4 hours. Prerequisite: Plant Science 2 or Botany 2, and Soil Science 100 or Agronomy 100. Environment and management factors affecting plant agriculture and farming systems in the tropics. Crops are considered in relation to shifting cultivation, rice-based cropping systems, annual cropping, polycropping and monoculture of perennial species.

102. Livestock and Poultry in Developing Nations (4) I, Vohra (Avian Sciences)

Lecture—4 hours. Prerequisite: consent of instructor. Animal production and problems of specific countries in Asia, Africa, and South America; 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.

103. Social Change and Agricultural Development (3) III. Brush

Lecture—3 hours. Prerequisite: one introductory course in cultural anthropology, sociology, political science, or economics. Social factors relating to technological change in agriculture. Demography, social stratification, cultural values discussed in relation to environmental and economic factors. General theories of technological innovation and evolution. Offered in even-numbered years.

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. Prerequisite: 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. Brush Seminar—1 hour. Presentation and discussion of current topics in international agricultural development by visiting lecturers, staff and students. May be repeated for credit. (P/NP grading only.)

191. Topics in International Agricultural Development (3) I, II, III. The Staff

Lecture-discussion—3 hours. Prerequisite: consent of instructor. Selected topics dealing with current issues in agricultural development in lesser developed nations—variable content. May be repeated for credit.

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)

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) II. The Staff

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 and Determinants of Cropping Systems (4) III. Cassman (Agronomy and Range Science)

Lecture—3 hours; discussion—1 hour. Prerequisite: course 101, Agricultural Science and Management 150 (or comparable statistics course). Cropping systems as a function of farmer objectives, resource availability, environment, and yield potential; interactions among management strategies, resource use efficiency, and the agroecosystem; stability, diversity, and sustainability of cropping systems.

201. Analysis of Farming Systems (4) II. Jarvis (Agricultural Economics)

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) I, II. Brush 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 or 201 preferably, or 202; or consent of instructor. Contexts of agricultural and rural development; strategies for program implementation; planning, staffing, and financing agricultural development; processes and structures of implementation; 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.)

291. Topics in International Agricultural Development (3) I, II, III. The Staff

Lecture—3 hours. Prerequisite: consent of instructor. Selected topics dealing with current issues in agricultural development in lesser developed nations. Variable content. May be repeated once for credit.

292. Graduate Internship (1-12) I, II, III. The Staff

Internship—3-36 hours. Prerequisite: participation in H. Humphrey Fellow Program or consent of instructor. Individually designed supervised internship, off or on campus, in community, business or institutional setting. Developed with advice of faculty mentor and Humphrey Coordinator. (S/U grading only.)

298. Directed Group Study (1-5) I, II, III. The Staff (Graduate Group Chairperson in charge) (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Graduate Group Chairperson in charge) (S/U grading only.)

International Agricultural Development (A Graduate Group)

Lovell S. Jarvis, Ph.D., Chairperson of the Group
Group Office, 106 Academic Office Building-IV
(752-0770/1926)

Faculty. The Group includes faculty from the Colleges of Agricultural and Environmental Sciences, Engineering, and Letters and Science, and the School of Veterinary Medicine.

Graduate Study. The International Agricultural Development M.S. degree program prepares U.S. and foreign students for careers in agricultural and rural development around the world. Many of its faculty members have had 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)

W. Eric Gustafson, Ph.D., Program Director
Program Office, 351 Voorhies Hall (752-3063)

Committee in Charge

- Moshe Adler, Ph.D. (*Economics*)
- Daniel R. Brower, Jr., Ph.D. (*History*),
Chairperson
- Michael R. Caputo, Ph.D. (*Agricultural Economics*)
- ³Dennis J. Dingemans, Ph.D. (*Geography*)
- W. Eric Gustafson, Ph.D. (*Economics*)
- Joyce K. Kallgren, Ph.D. (*Political Science*)
- David L. Lalman, Ph.D. (*Political Science*)
- John E. Lofland, Ph.D. (*Sociology*)
- Michèle Praeger, Ph.D. (*French*)
- Janet S. Shibamoto, Ph.D. (*Anthropology*)
- Young-Kwan Yoon, 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 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 knowledge (approximately 26 to 30 units of course credits or equivalent fluency) of one other modern 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 other countries.

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.

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	25-52
Economics 1A, 1B	10
Political Science 3	4
Geography 10	3
History 4C	4
One course selected from Anthropology 2, Geography 2, History 4B, 9A, 9B, 10, 15, 17B, International Agricultural Development 10, Political Science 1, 2	3-4
Approximately 26 to 30 units (or the equivalent) in one modern foreign language	0-27
Recommended: one course in statistics (e.g., Sociology 46A, 46B, Statistics 13)	
Depth Subject Matter	45-50
Economics 115A or 115B	4
Economics 160A-160B (Cluster I) or 162 (Clusters II, III, IV)	4-8

(Cluster I students: note prerequisite for courses 160A-160B.)

Political Science 123	4
Political Science 130	4
Cluster emphasis	32

Choose one from the four clusters shown below. Courses must be in addition to those applied toward requirements above.

Total Units for the Major 70-102

Course List for Cluster Emphasis

Cluster I: World Trade and Development
(Heavy economic emphasis; suitable particularly for students who seek careers in international business or international organizations)

- Economics 100
- Economics 101
- Economics 160A-160B
Economics 160A fulfills one core requirement; Economics 160B fulfills a cluster requirement.
- One course to be selected from:
Economics 115A or 115B (whichever course is not used to fulfill the core requirement above), 118
- Two courses to be selected from:
Anthropology 122, 126, 131, 135
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, 131, 135
Sociology 118, 139, 141, 145
Political Science 124, 126, 127, 128, 178
Economics 110B, 115A or 115B (whichever course is not used to fulfill the core requirement above), 116
- Four regional courses focused on Third World:
Select two courses from Group A (History)
Select two courses from Group B (Anthropology, Economics, Geography, Political Science, and Sociology)

Cluster III: 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, 175, Sociology 144
Population—Sociology 102, 170
Rural Development—Anthropology 126, 131, 133, 135
Urbanization—Anthropology 127, Geography 156, Sociology 143A, 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 is on national governments and their activities in the global political system)

- One course to be selected from:
Political Science 120, 121,
- Two courses to be selected from:
Economics 116
History 145, 146A, 146B, 147A, 147C,
Political Science 112, 128, 132, 140, 177, 178
Sociology 119, 157, 165A
- One course to be selected from:
Anthropology 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, 155A, 155B, 155C, 161B, 163B, 165, 166B, 168, 174B, 174C, 190C, 193, 194C, 195, (History 102 with

advance approval by faculty adviser; History 145, 146A, and 146B may be offered only once toward the major)

Regional Courses—Group B

Anthropology 140A, 140B, 142, 144, 147, 149
Economics 170, 171, 172, 173
Geography 122A, 122B, 123, 124, 125A, 125B, 126, 127
Political Science 131, 133, 134, 136, 137, 138, 141, 146, 148A, 148B, 149, (Political Science 129, 139, 179 with advance approval by faculty adviser)
Sociology 147

Major Adviser. W. E. Gustafson (*Economics*).

Courses in International Relations

Lower Division Courses

- 98. **Directed Group Study** (1-5) I, II, III.
Prerequisite: consent of instructor. (P/NP grading only.)
- 99. **Special Study for Undergraduates** (1-5) I, II, III.
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

- 190. **Topics in International Relations** (4) I, II, III.
Lecture-discussion—4 hours. Prerequisite: consent of instructor. Selected topics in international relations. Variable content. May be repeated for credit when a different topic is studied.
- 192. **International Relations Internship** (1-12) I, II, III. The Staff (Committee Chairperson in charge)
Internship—3-36 hours (to be arranged). Prerequisite: upper division standing and consent of instructor. Work experience in international relations, with term paper analyzing the practical experience of the student. (P/NP grading only.)
- 198. **Directed Group Study** (1-5) I, II, III.
Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)
- 199. **Special Study for Advanced Undergraduates** (1-5) I, II, III.
Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

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:

Preparatory Subject Matter UNITS
Italian 1, 2, 3, 4, 5, and 9 (or the equivalent) 0-24

Depth Subject Matter 36
Italian 101 and either 102 or 104 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 36-60

Recommended

One year of college Latin or a Romance Language.

Major Adviser. G. Foscarini.

Minor Program Requirements:

Italian UNITS
Language, Italian 101 and either 102 or 104 8
Literature, three courses chosen in consultation with major adviser 12
One course chosen from each of the following three areas: (a) Early Italian Literature, (b) Renaissance and Baroque, and (c) Eighteenth through Twentieth Centuries. (One of the above courses may be replaced by course 107 or by a course of literature in translation offered by the Italian Program).

Prerequisite Credit. Credit will not normally be given for a course if it is a prerequisite of a course already successfully completed. Exceptions can be made only by the Program Director.

Honors and Honors Program. The honors program comprises two quarters of study under course 194H, which will include a research paper and a comprehensive examination. See also sections on University and College requirements.

Teaching Credential Subject Representative. See Major Adviser above and also the section on the Teacher Education Program in this catalog.

Courses in Italian

Lower Division Courses

Students offering high school language preparation as a prerequisite must take a placement test.

1. Elementary Italian (5) I, II, III. Foscarini in charge
Discussion—5 hours; laboratory—1 hour. Introduction to Italian grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Italian 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Italian (5) I, II, III. Foscarini in charge
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of course 1 in areas of grammar and basic language skills.

3. Elementary Italian (5) I, II, III. Foscarini in charge
Lecture-discussion—5 hours. Prerequisite: courses 2. Continuation of grammar sequence, and practice of all language skills through cultural texts.

4. Intermediate Italian (3) I, II, III. The Staff
Lecture-discussion—3 hours. Prerequisite: course 3 or the equivalent. Review of grammar and syntax through written exercises, and readings of short prose works. Intended to develop the linguistic foundations of students who have completed the first-year language classes.

5. Intermediate Italian (3) I, II, III. The Staff
Lecture-discussion—3 hours. Prerequisite: course 4 or the equivalent. Review and study of grammar and syntax, readings of short prose works, and written exercises. Intended to prepare students to read, understand and discuss modern Italian.

8A. Italian Conversation (3) I, III. The Staff
Discussion—3 hours. Prerequisite: course 3 or the equivalent. Course designed to offer practice in speaking Italian. May be repeated once for credit. (P/NP grading only.)

8B. Italian Conversation (3) II. The Staff
Discussion—3 hours. Prerequisite: course 8A. Course designed to offer practice in speaking Italian. (P/NP grading only.)

9. Reading Italian (3) I, II, III. The Staff
Lecture-discussion—3 hours. Prerequisite: course 5. Reading and discussion of modern Italian prose, including selections from creative, scientific and journalistic writings. Introduction to contemporary Italian literature and culture, as well as a means of strengthening the student's command of the Italian language.

25. Italian Literature in Translation (3) II. The Staff (Program Director 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 9 or consent of instructor.

102. Advanced Conversation, Composition, and Grammar (4) II. De Petris
Lecture-discussion—3 hours; weekly essays. Prerequisite: course 101 or consent of instructor.

104. Italian Translation and Style (4) III. Dutschke
Lecture-discussion—3 hours; two research papers; term paper. Prerequisite: course 101 or consent of instructor. Practice in translation from Italian to English and English to Italian, using literary and non-literary texts of different styles. Analysis of linguistic problems and elements of style contained in the translation material.

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 9 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

Italian

(College of Letters and Science)

Dennis J. Dutschke, Ph.D., Program Director

Department Office (French and Italian), 511
Sproul Hall (752-0830)

Faculty

³Alfonso De Petris, *Dottore in Filosofia*, Professor
Dennis J. Dutschke, Ph.D., Associate Professor
Gustavo Foscarini, M.A., Lecturer
Manuela Gieri, *Dottore in Lettere*, Assistant 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.

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

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 9 or consent of instructor. Study of the origins of lyrical forms of Italian literature in 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 9 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 9 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 9 or consent of instructor. Continued examination into the loss of an ideal. Emphasis on the conflicts in Michelangelo and Tasso leading to Marino, with an excursus on Galileo's role in the formation of a modern literary standard.

***118. Italian Literature of the Eighteenth Century** (4) I, De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Development of modern Italian literature. Emphasis on the work of Goldoni, Bettinelli, Baretti, Parini, Alfieri and Vico.

***119. Italian Literature of the Nineteenth Century** (4) II, De Petris
Lecture-discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Aspects of Romanticism in Italy; including Manzoni, Verga and *Verismo*.

120A. Italian Literature of the Twentieth Century: The Novel (4) III, Gieri
Lecture-discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Development of the novel from Svevo to the present. Emphasis on the work of Svevo, Levi, Moravia, Pavese and Vittorini.

120B. Italian Literature of the Twentieth Century: Poetry and Drama (4) I, Gieri
Lecture-discussion—3 hours; term paper. Prerequisite: course 9 or consent of instructor. Italian poetry with emphasis on Hermeticism; the theater of Luigi Pirandello and its role in the development of contemporary Italian drama.

***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 Boccaccio and their relations to the Middle Ages and the Renaissance; the Renaissance, with particular attention to the works of Lorenzo de' Medici, Leonardo da Vinci, Machiavelli, Ariosto, Michelangelo, and Tasso.

***139C. Italian Literature in English: Modern Italian Literature** (4) III, Gieri
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.

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, The Staff
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 (Dutschke in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, The Staff (Dutschke in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Japanese

See Chinese and Japanese

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*)

Francis E. Broadbent, Ph.D., Professor Emeritus (*Soil Microbiology*)

Richard G. Burau, Ph.D., Professor (*Soil Science, Environmental Toxicology*)

John J. Carroll III, Ph.D., Professor (*Meteorology*)

Kinsell L. Coulson, Ph.D., Professor Emeritus (*Meteorology*)

C.C. Delwiche, Ph.D., Professor Emeritus (*Geobiology*)

Emanuel Epstein, Ph.D., Professor Emeritus (*Plant Nutrition, Botany*)

Robert G. Flocchini, Ph.D., Professor (*Resource Sciences*)

Richard D. Grotjahn, Ph.D., Associate Professor (*Atmospheric Science*)

Gordon L. Huntington, Ph.D., 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., Associate Professor (*Atmospheric Science*)

H. Michael Reisenauer, Ph.D., Professor Emeritus (*Soil Science*)

Victor V. Rendig, Ph.D., Professor Emeritus (*Soils and Plant Nutrition*)

Dennis E. Rolston, Ph.D., Professor (*Soil Science*)

Roger H. Shaw, Ph.D., Professor (*Meteorology*)

Michael J. Singer, Ph.D., Professor (*Soil Science*)

Su-Tzai Soong, Ph.D., Associate Professor (*Atmospheric Science*)

Randal J. Southard, Ph.D., Assistant Professor (*Soil Genesis/Morphology*)

Harry O. Walker, Ed.D., Senior Lecturer (*Resource Sciences*)

Bryan C. Weare, Ph.D., Associate Professor (*Meteorology*)

Lynn D. Whittig, Ph.D., Professor Emeritus (*Soil Science*)

Robert Zasoski, Ph.D., Assistant 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 Emeritus (*Water Science, Civil Engineering*)

Lloyd D. Doneen, Ph.D., Professor Emeritus (*Water Science and Engineering*)

Donald W. Grimes, Ph.D., Lecturer (*Water Science*)

Mark E. Grismer, Ph.D., Assistant Professor (*Water Science, Agricultural Engineering*)

Robert M. Hagan, Ph.D., Professor Emeritus (*Water Science*)

Delbert W. Henderson, Ph.D., Professor Emeritus (*Water Science*)

Jan W. Hopmans, Ph.D., Visiting Assistant Professor (*Water Management*)

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*)

Donald R. Nielsen, Ph.D., Professor (*Soil and Water Science*)

Carlos E. Puentes, Ph.D., Assistant Professor (*Hydrology*)

Frank E. Robinson, Ph.D., Lecturer (*Water Science*)

Verne H. Scott, Ph.D., Professor (*Water Science, Civil Engineering*)

Wendy Kuhn Silk, Ph.D., Professor (*Water Science*)

Kenneth K. Tanji, M.S., Professor (*Water Science*)

Wesley W. Wallender, Ph.D., Associate Professor (*Water Science, Agricultural Engineering*)

Land, Air and Water Resources is a multidisciplinary department with faculty who specialize in atmospheric, plant, resource, soil and water science, and water engineering. Teaching and research focus on both agricultural and environmental science. The faculty contribute to numerous other undergraduate and graduate programs in the Colleges of Letters and Science, Engineering, and Agricultural and Environmental Sciences.

Major Programs. Undergraduates in the department major in Atmospheric Science, Resource Sciences, and Soil and Water Science.

Advising Center is located in 122 Hoagland Hall (752-1669).

Graduate Study. Four graduate programs, Atmospheric Science, Earth Sciences and Resources, Soil Science, and Water Science are administered by Land, Air and Water Resources.

Courses. See courses listed under Atmospheric Science, Earth Sciences and Resources, Resource Sciences, Soil Science, and Water Science.

Graduate Study. Graduate work offered in the area of resource sciences is Atmospheric Science, Earth Sciences and Resources, 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.

Students are admitted to the Landscape Architecture major only after submitting a portfolio for review and selection by the faculty. Contact the Environmental Design Advising Center or the Landscape Architecture major adviser for further information.

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	50-58
Biological sciences (Biological Sciences 1, 10)	4-5
Botany (Botany 2, Plant Science 2)	5
Chemistry (Chemistry 1A, 10)	4-5
Physics (Physics 1A, 6A, 10)	3-4
English (English 1, 2, 20, 103)	4
Public speaking (Rhetoric and Communication 1)	4
Two-dimensional design (Art 16, Design 21, Engineering 4)	3-4
Three-dimensional design (Art 5, 121A, 142, Design 130, 134, 135, 180A, 180C)	4
Earth sciences (Geography 1, Geology 1, Soil Science 10)	3
Economics (Economics 1A, 1B, Agricultural Economics 147)	4-5
Computer science (Agriculture Science and Management 21, Engineering 5, Computer Science Engineering 10, 40)	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	70-74
Introduction to landscape architecture (Landscape Architecture 40)	3
Landscape architecture studio: introduction, recreational open space, site planning (Landscape Architecture 111, 112, 113)	12
Landscape graphic communication (Landscape Architecture 121)	4
Advanced communication for landscape architecture (Landscape Architecture 122)	4
Introduction to landscape construction, site engineering, construction details and drawings (Landscape Architecture 131, 132, 133, 134)	15
History of landscape architecture (Landscape Architecture 140)	3
Introduction to environmental plants (Environmental Horticulture 6)	2
Taxonomy and ecology of environmental plants (Environmental Horticulture 105)	4
Arboriculture (Environmental Horticulture 133)	4
Plant selection for environmental design (Landscape Architecture 155)	3
Landscape planting design (Landscape Architecture 156)	4
Landscape architecture studio: planning and analysis, urban and community design (Landscape Architecture 181, 182)	8
Senior project in landscape architecture (Landscape Architecture 193)	1-5

Proseminar, three quarters (Landscape Architecture 190)	3
Internship (Landscape Architecture 192) recommended.	
Breadth Subject Matter	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 1)	

Unrestricted Electives

Total Units for the Major 180

Major Adviser. M. Francis (*Environmental Design*).

Advising Center is located in 152 Walker Hall (752-1165).

Graduate Study. Refer to the Graduate Division section in this catalog.

Courses in Landscape Architecture

Lower Division Course

40. Introduction to Landscape Architecture (3) I, Francis
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. The Staff
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: Landscape Form, Design, and Art (4) II. Thayer
Lecture-discussion—2 hours; laboratory—6 hours; field trips. Prerequisite: course 111; major in Landscape Architecture. Studio problems in design of landscapes and outdoor places which rely on visual, spatial, aesthetic, and symbolic characteristics.

113. Landscape Architecture Studio: Site Planning (4) III. The Staff
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. McNiel
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. Introduction to Landscape Construction (3) I. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: courses 40 and 111 (may be taken concurrently); Agricultural Engineering Technology 15 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. The Staff
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. The Staff
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. The Staff
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.

140. History of Landscape Architecture (3) III. The Staff
Lecture—3 hours. History of landscape architecture as an art form, technology, and profession. Emphasizes design of gardens and outdoor spaces from prehistoric civilizations to the present. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Art 1A, 1B, or History 3.

155. Plant Selection for Environmental Design (3) III. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: Botany 2, and course 40 or Environmental Horticulture 6. Ecological and cultural parameters of selecting plant materials for use in environmental design and planning. Contemporary themes in climate, energy conservation, low maintenance, restoration, habitat, edible landscape, historic preservation, use of natives, specialized landscapes, and computerized plant selection.

156. Landscape Planting Design (4) I. The Staff
Studio—8 hours. Prerequisite: course 111, Environmental Horticulture 105, Landscape Architecture 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. The Staff
Studio—8 hours; two all-day field trips. Prerequisite: course 113. Landscape architecture studio to include the solution of large-scale landscape architectural problems with emphasis on landscape planning and analysis methods and environmental concerns. Limited enrollment.

182. Landscape Architecture Studio: Urban and Community Design (4) II. Francis
Studio—8 hours; two all-day field trips. Prerequisite: course 181. Solution of community and urban landscape design problems with emphasis on community and social processes, participatory design methods, and comprehension of behavioral factors relating to urban open space. Limited enrollment.

190. Proseminar in Landscape Architecture (1) I, II, III. McNiel, Francis, Thayer
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. Thayer
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. (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, commu-

nication, 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. (S/U grading only.)

299. Directed Individual Research for Graduate Students (1-5) I, II, III. The Staff
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Latin

See Classics

Law, School of

Florian Bartosic, B.C.L., LL.M., Dean of the School

Gary Goodpaster, J.D., Associate 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

Homer G. Angelo, J.D., LL.M., Professor Emeritus

John D. Ayer, J.D., LL.M., Professor

Roger Baron, J.D., Lecturer

Edward L. Barrett, Jr., J.D., Professor Emeritus

Florian Bartosic, B.C.L., LL.M., Professor

Antonia E. Bernhard, J.D., Lecturer

Edgar Bodenheimer, J.U.D., LL.B., Professor Emeritus

Alan E. Brownstein, J.D., Professor

Carol S. Bruch, J.D., Professor

Thomas E. Carbonneau, M.A., J.D., LL.M., S.J.D., Visiting Professor

Ronald Chester, M.A., J.D., Visiting Professor

Joel C. Dobris, LL.B., Professor

Harrison C. Dunning, LL.B., Professor

Daniel J. Dykstra, LL.B., S.J.D., Professor Emeritus

Floyd F. Feeney, LL.B., Professor

³Daniel Wm. Fessler, J.D., S.J.D., Professor

¹Susan F. French, J.D., Professor

Michael J. Glennon, J.D., Professor

Gary Goodpaster, J.D., Professor

Sarah D. Gray, Ph.D., Professor (*Human Physiology*)

Louis Haffner, J.D., Lecturer

Robert W. Hillman, J.D., Professor

³James E. Hogan, LL.B., Professor

Edward J. Imwinkelried, J.D., Professor

Margaret Z. Johns, J.D., Lecturer and Director of Legal Writing

Friedrich K. Juenger, J.D., Professor

¹Leslie A. Kurtz, M.A., J.D., Professor

Cecilia D. Lannion, LL.B., Lecturer

Pierre R. Loiseaux, LL.B., LL.M., Professor

¹Jean C. Love, J.D., Professor

²John B. Oakley, J.D., Professor

Terry O'Neill, J.D., Acting Professor

²Raymond I. Parnas, J.D., LL.M., S.J.D., Professor

Rex R. Perschbacher, J.D., Professor

¹John W. Poulos, J.D., Professor

Edward H. Rabin, LL.B., Professor

Mortimer D. Schwartz, J.D., LL.M., M.S., Professor

Bernard S. Schweigert, Ph.D., Professor (*Food Science and Technology*)

Daniel L. Simmons, J.D., Professor

James F. Smith, J.D., Lecturer

Martha S. West, J.D., Acting Professor

Bruce A. Wolk, M.S., J.D., 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 at the end of the School of Law section at the front of the catalog. The symbols are (I) for Fall Semester and (II) for Spring Semester.

Courses in Law

Professional Curriculum

First Year Courses

200. Introduction to Law (1) I, Poulos, Ayer
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, Rabin, Chester
Discussion—3-3 hours. Study of doctrines and concepts of property law with primary emphasis on real property. Course coverage includes: the estates in land system, the landlord-tenant relationship, conveyancing, and private and public land use control. (Deferred grading only, pending completion of sequence.)

202A-202B. Contracts (3-3) I-II. Loiseaux, Imwinkelried, Fessler
Discussion—3-3 hours. Course examines the sorts of promises that are enforced and the nature of protection given promissory obligations in both commercial and noncommercial transactions. Inquiry is made into the means by which traditional doctrine adjusts—or fails to adjust—to changing social demands. (Deferred grading only, pending completion of sequence.)

203A-203B. Civil Procedure (3-3) I, Hogan, Perschbacher; II, 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. (Deferred grading only, pending completion of sequence.)

204A-204B. Torts (3-3) I-II. Brownstein, Carbonneau, Johns, Juenger
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 concerned with intentional and unintentional invasions of personality and property. More specifically, the course seeks to analyze civil actions based upon wrongs such as assault, battery, false imprisonment, negligence, strict liability, defamation, invasion of privacy, and misrepresentation. Alternatives to the present tort compensation system are also considered. (Deferred grading only, pending completion of sequence.)

206. Criminal Law (3) I, Feeney, Hogan
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, 269, 270, 274
- (d) Commercial Law: 216, 237, 243
- (e) Constitutional Law: 217, 218, 288
- (f) Consumer Law: 253, 266, 269
- (g) Criminal Law: 227, 275, 276, 284, 290
- (h) Estate Planning: 221, 223

- (i) Family Law: 225, 230, 234, 272, 273, 281
- (j) International Comparative and Foreign Law: 233, 248, 249, 257, 259
- (k) Labor Law: 251, 260, 271, 279, 293
- (l) Procedure and Jurisdiction: 219, 239, 242, 246, 283, 295
- (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
- (q) Topical Survey Courses: 212, 226, 240, 244, 252, 267, 277, 280, 286, 292, 296
- (r) Individual and Group Study: 298, 299, 416, 417, 418, 419
- (s) Clinical Programs: 420, 425, 440, 450, 455, 470, 480, 495

*209. Legal Imagination (2)

Discussion—2 hours; papers. 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)

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.

Seminar—2 hours. Course teaches negotiation, mediation, arbitration skills, and theories. Students will do five or more practice negotiations, mediations, or arbitrations to develop skills, perception, and personal style. Class discussion and theory development are based on these exercises. Limited enrollment.

*212. Biotechnology, Bioethics and the Law (3)

Discussion—3 hours. Legal, moral and economic analysis of problems posed or soon to be posed by advances in biomedical technologies. Includes examination of problems raised by: (1) behavior control through organic intervention, including psychosurgery, psychoactive drugs, and electrical stimulation of the brain; (2) genetic engineering; (3) amplification of human powers and faculties by artificial means, including organ transplantation, man-machine symbiosis, and pharmacologically induced enhancement of mental functioning; (4) death and dying; and (5) regulation of experimentation with human subjects. In each area, discussion will include problems in distributive justice posed by limited availability of biotechnological commodities, as well as issues arising from enforced treatment.

*213. Business Organizations I (3)

Discussion—3 hours. Focus on public issue corporation. Both statutory and judge-made legal principles of state corporate law, and federal regulation of the corporation will be studied. Corporate governance and the proxy voting system, insider trading, suits against corporations, regulation of the sale of securities and distribution of dividends, and the merger and acquisition of corporations will be covered.

*214. Business Organizations II (3)

Discussion—3 hours. Building upon the development of the public issue corporation in course 213, this course centers on the legal problems of a business owned by a few persons each of whom may seek to play an active role in the enterprise. Included within the survey are the problems of the "close corporation" and the alternatives to incorporation for persons in quest of profit. These alternatives include proprietorship, general and limited partnerships, and joint ventures. Related agency concepts are integrated into this material.

215. Business Associations (4) I, Hillman

Discussion—4 hours. Course provides a broad survey of the legal rules and concepts applicable to business associations, both public and closely held. Principal attention is given the corporate form of organization, although partnerships are also treated briefly. Topics surveyed include the planning of business transactions, the process of incorporation, the financing of corporations, the role of managements and shareholders, the federal securities laws, and social responsibility.

216. Commercial Law: Article 9 (3) II. Loiseaux

Discussion—3 hours. Prerequisite: course 243 recommended. Course covers security interests in personal property.

217. Constitutional Law I (3) I, Brownstein, Goodpaster

Discussion—3 hours. Course covers the principles, doctrines, and controversies regarding the basic structure of, and division

of powers in, American government. In particular it treats judicial review, jurisdiction, standing to sue, federalism, federal and state powers and immunities, and the separation of powers between branches of the federal government. It also begins an examination, continued in the second semester, of procedural and substantive constitutional rights and the limits they place on governmental action.

218. Constitutional Law II (3) II. Brownstein, Goodpaster
Discussion—3 hours. Course principally covers First and Fourteenth Amendment rights. The First Amendment study involves an examination of freedom of speech and assembly, including political speech and association, commercial and corporate speech, government speech and regulation of the media, speech in public places, expressive conduct, and obscenity. It also examines religious freedom, the separation of church and state, and state aid to religious schools. The Fourteenth Amendment study considers due process and equal protection, and fundamental rights they imply; rights against religious, racial, gender, alienage and other forms of discrimination. Included in the Fourteenth Amendment study are examination of racial desegregation, "affirmative action," government enforcement of civil rights, equal rights for the sexes, and voting rights.

219. Evidence (4) I. Inwinkelried; II, Wydick
Discussion—4 hours. The rules regarding the admissibility of testimonial and documentary proof during the trial of civil and criminal cases, including the concept of relevancy, the hearsay rule, the examination and impeachment of witnesses, the opinion rule, constitutional and statutory privileges.

220. Federal Income Taxation (4) I. Simmons; II, Wolk
Discussion—4 hours. Introduction to basic principles of federal income taxation. Topics include identification of income subject to tax, gains and losses from property transactions, deductions from income, the timing of income and deductions (tax accounting), and the identity of persons subject to tax on particular items of income.

221. Trusts, Wills and Decedents' Estates (3) I. Dobris; II, Chester
Discussion—3 hours. Study of the law of wills and trusts. Course coverage includes: intestate succession; family protection and limits on the power of testation; execution, revocation and revival of wills; contracts to make wills; will substitutes; inter vivos and testamentary private trusts. Depending on the instructor the course may also cover one or more of the following topics: class gifts; powers of appointment; the Rule Against Perpetuities; and introduction to the administration of estates and trusts, including powers, duties, rights and liabilities of fiduciaries and the management of assets.

***222. Agricultural Law (3)**
Discussion—3 hours. Basic business law in the context of the production and marketing of agricultural commodities, with an emphasis on regulations and structures unique to the agricultural sector (e.g., marketing orders, cooperatives, the farm credit system). Consideration will also be given to business and tax planning for the agricultural producer. Option of final examination or research paper.

223. Estate Planning (2) II. Dobris
Seminar—2 hours. Prerequisite: course 221. Selected topic(s) in the estates and trusts area. Class presentation and research paper will satisfy the legal writing requirement. Limited enrollment.

225. Marital Property (3) I, II. Bruch
Discussion—3 hours. The California community property system including treatment of property during marriage and upon dissolution of marriage or death of a spouse. Rights between the spouses and as to creditors are emphasized. Marriage, nonmarital cohabitation, dissolution of marriage and nullity, relationship and property agreements and spousal support are also covered.

***226. Mass Media Law (2)**
Discussion—2 hours. Course will survey legal issues associated with the mass media. Topics covered will include legal problems of news media and news gathering, the regulation of broadcasting, free press/fair trial, and cable television, and the effect of the new technologies.

227. Criminal Procedure (3) I. Feeney, II, Parnas
Discussion—3 hours. The police function: arrest, search and seizure, electronic surveillance, entrapment, police interrogation and confessions, lineup, 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)**
Seminar—2 hours. Study of selected current issues in agricultural regulation and trade. Instructor and students will select issue areas for study. Class presentation and paper required.

230. Family Law (Short Course) (2) I. Bruch
Discussion—2 hours. Survey of history, current law, and policy regarding marriage, divorce, and their consequences. Extent of governmental intrusion into individual and family privacy is the over-riding policy issue. Role of the family lawyer is the key practical issue. Among subjects covered are constitutional framework, non-marital cohabitation, marriage regulation, spouse abuse, juvenile court over-view, divorce, support, custody, and adoption confidentiality. (Conflict of laws and marital property not included.)

231. Legislative Process (3) II. Glennon
Discussion—3 hours. Course covers fundamental elements of the legislative process, including legislative procedure; the legislator as an institution; the legislative investigative power; lobbying; legislative-executive relations; and the legislature's constitutional powers and limitations.

232. Real Estate Finance (2) II. Glennon
Discussion—2 hours. Examination of the problems involved in the acquisition, financing and development of real estate and of lender remedies and debtor protections in the event of debtor default. Course strongly oriented toward current California law, and toward practical application of legal doctrines.

233. International Human Rights (2) II. Glennon
Seminar—2 hours. Selected topics pertaining to the protection of individuals under treaties and norms of customary international law. Specifically, the seminar will explore problems such as the extent to which national courts are required to uphold such rights; how the U.N. can create human rights norms; the investigation of violations of human rights law; remedies and international enforcement mechanisms; the use of force for human rights purposes; and the substantive requirements of specific human rights norms such as those concerning war crimes, genocide, apartheid, terrorism, and torture. Seminar paper will satisfy the advanced legal writing requirement.

234. Family Law Practice (3) II.
Seminar—2 hours: clinical—1 hour. Prerequisite: course 225; course 230 or 272 (concurrently) recommended. Combined seminar and clinic to provide marital-legal counseling under the direct supervision of the instructor. Clinical participation required twice during semester. Students also participate in weekly 2-hour seminar which will cover a wide range of topic areas pertaining to family law practice. Limited enrollment. (S/U grading only.)

235. Administrative Law (3) II. O'Neill
Discussion—3 hours. Prerequisite: course 217, or consent of instructor. Control of the administrative operations of government will be studied. Federal regulation of business enterprise and of the provision of social services and subsidies provide the principal examples of subjects to be treated. Various statutory delegations of power to administrative agencies and attempts by the judiciary, executive and legislative branches to control these delegated powers will be studied in some depth. Protection of individual rights, such as those of employees and recipients of government benefits, in the complex context administrative state, and the regulation of particular industries, will also receive attention.

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)**
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 Flow-Through Entities: Partnerships and Subchapter S (3) II. Simmons
Discussion—3 hours. Prerequisite: course 220. Owners of partnerships and subchapter S corporations (flow-through entities) are taxed on items of income, deduction, and loss, as if the owner incurred the item directly. Examination of the identity, organization, operation, and dissolution of flow-through entities in terms of the tax impact of these events on owners and investors.

239. Conflict of Laws (Short Course) (3) II. Bruch
Discussion—3 hours. Abbreviated study of transactions with multistate or international contacts. Emphasis will be on recognition of foreign judgments of choice of applicable law; jurisdictional issues will be treated only briefly. Course deals with problems practitioners frequently encounter in a wide variety of fields such as commercial law, family law and personal injury law.

240. Law of Elections and Political Campaigns (2) I. Feeney
Discussion—2 hours. Course covers constitutional, statutory, administrative and case law aspects of federal and state elections, including laws relating to primaries, general elections, initiatives, recalls, filing requirements, financial disclosures and conflicts of interest.

***241. Legal Accounting (2)**
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 (more than six credit hours) may not enroll in this course.

242. Conflict of Laws (Long Course) (4) I. Juenger
Discussion—4 hours. Study of transactions with multistate or international contacts. The topics covered include jurisdiction, recognition of foreign judgments, and choice of applicable law. The course deals with problems practitioners frequently encounter in a wide variety of fields, such as commercial law, family law and personal injury law.

243. Debtor and Creditor (3) I. Rubin
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
Lecture—2 hours. Overall view of the anatomy and physiology of the human body, giving the law student a basic understanding of the normal structure and functioning of the various organ systems. Medical terminology is stressed and students have an opportunity to analyze the medical aspects of several medical-legal cases. (S/U grading only.)

245. Estate and Gift Taxation (3) II. Wolk
Discussion—3 hours. Prerequisite: course 220. Study of the federal taxation of gifts, trusts, and estates.

246. Federal Jurisdiction (3) II. Oakley
Discussion—3 hours. Study of the subject matter jurisdiction of federal courts. Statutory provisions for the federal district courts to adjudicate civil actions arising under federal law or between parties of diverse citizenship will be examined in contemporary detail, and from the perspective of history and the Constitution. Federal appellate jurisdiction, federal writs in the nature of habeas corpus, and miscellaneous matters affecting attorneys' decisions to seek a federal forum will also be discussed. In addition to careful study of the fine points of relevant legislation in light of their history, the course will examine and develop the constitutional doctrines of separation of powers and federalism as guides to understanding the Supreme Court's leading opinions on the scope of federal jurisdiction.

247. Taxation of Corporations and Shareholders (4) I. Simmons
Discussion—4 hours. Prerequisite: course 220. Corporations and shareholders are subject to income tax at both the entity and shareholder level. The course examines the income tax consequences at both levels with respect to organization, financing, operation, reorganization, and dissolution of corporate entities. The course will also examine tax planning for affiliated groups of corporations.

248. International Law (3) I. Glennon
Discussion—3 hours. This introductory course covers basic international law concepts such as statehood and recognition; treaty law and customary international law; use of force; human rights and war crimes; expropriation; the relationships between international law and national law; and the jurisprudence of international law.

***249. Comparative Law (2)**
Discussion—2 hours. Comparison of methods and sources of common and civil law; background and structure of the principal civil codes; analysis and study of problems arising in international transactions.

250. Jurisprudence: American Legal Thought (2) I. Chester
Seminar—2 hours. Course begins with reading in and class discussion of topics in American legal thought, including economic instrumentalism, formalism, realism, law and economics, and critical legal studies. After research and paper preparation, students present their paper topics for class discussion. Satisfies legal writing requirement. Limited enrollment.

251. Labor Law (3) I. West
Discussion—3 hours. Study of federal 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.

It explores potential remedies drawn from constitutional law, statutory enactments, and common law developments. Subject matter areas include sex-based discrimination in family law and employment law. The course also considers the laws prohibiting discrimination against gay men and lesbians.

***253. Products Liability (3)**

Discussion—3 hours. Civil action for harm to the consumer resulting from dangerous and defective products.

255. Pension Law (3) I, Wolk

Discussion—3 hours. Federal regulation and taxation of private pensions and other forms of deferred compensation and tax-favored retirement savings. The course will focus on the Employee Retirement Security Act of 1974 (ERISA) and will deal with such topics as coverage, vesting, integration with social security, funding, age and sex discrimination, spousal interests (both during marriage and after divorce), retiree health and welfare plans, and preemption of state law. Fiduciary problems will also be examined, particularly in the area of corporate takeovers and plan investments. Problems surrounding plan terminations will also be considered, including bankruptcy issues. Pension Benefit Guaranty Corporation insurance, and the issue of asset reversions to employers in the case of overfunded plans.

***256. Land Use Planning (2)**

Discussion—2 hours. 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, general plans, and environmental controls affecting land use.

257. Foreign Relations Law (3) I, Glennon

Seminar—3 hours. Seminar covers subjects such as the war power, the treaty power and executive agreements, arms sales and military assistance, the recognition power, the negotiation power, the scope of the appropriations power as a check on executive activities, and other separation-of-powers issues generated by the intersection of international law and constitutional law. Class presentation and required seminar paper will satisfy the advanced legal writing requirement.

258. Professional Responsibility (1) I, Perschbacher; II, Wydick, Schwartz

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. Disability Rights Law (2) II, Wolinsky

Discussion—2 hours. Survey of legal issues involving the rights of disabled persons. (S/U grading only.)

260. Employment Discrimination (3) II, West

Discussion—3 hours. Consideration of employment discrimination based upon race, color, religion, sex, national origin, age, and sexual orientation. Course will focus on Title VII of the Civil Rights Act of 1964, and include coverage of Art. 1981, Art. 1983, the Equal Pay and Age Discrimination Acts. State fair employment laws will also be discussed.

***261. Local Government (2)**

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 counselors.

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, Hogan, Imwinkelried; II, Imwinkelried
Discussion—2 hours; laboratory—2 hours (evenings). Prerequisite: course 219. Introduction to the preparation and trial of cases, featuring lectures, videotapes, demonstrations, assigned readings and forensic drills. (S/U grading only.) Limited enrollment.

263B. Trial Practice II (2) II.

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.) Limited enrollment.

264. Water Law (3) II, Dunning

Discussion—3 hours. Property rights in surface waters, including riparianism, prior appropriation and federal reserved rights; water administration institutions, including the federal reclamation program; the law of interstate waters and property rights in ground water. Emphasis is placed upon California water law and policy.

265. Seminar in Natural Resources Law (2) I, Dunning

Seminar—2 hours; research paper. 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 will select one such issue for development within the seminar and will be expected to prepare a substantial research paper on that issue which would satisfy the advanced legal writing requirement.

266. Food Law (2) I, Loiseaux, Schweigert

Discussion—2 hours. Legal and scientific issues involved in the 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. Alternative Dispute Resolution (2) I, Carbonneau

Discussion—2 hours. Studies various methodologies and procedures for achieving the resolution of conflict in society. Focuses principally upon private law disputes—claims arising in the consumer, commercial, family and tort contexts. Initial consideration will be given to the adversarial ethic and whether the current approach to lawyering is responsive to practical and humanistic goals. This is followed by a systematic evaluation of the alternatives to judicial adjudication: conciliation, mediation, and arbitration. How viable are these mechanisms and do they compromise the protection of substantive rights? Will "bargaining in the shadow of the law" result in a less conflictual society? Class considers the development and criticism of the ADR movement and assesses how this emerging view of dispute resolution might alter their practice as lawyers.

269. Corporate Finance (2) II, O'Neill

Discussion—2 hours. Prerequisite: course 213 or 215. Enterprise and securities valuation, capital structure and senior securities, law and finance of dividends and retained earnings, mergers and acquisitions and the "market for corporate control," and the role of information and disclosure regulation in the modern capital markets. Both legal rules and policy implications will be addressed. No background in economics and finance is required, but students should expect to encounter both economic and financial concepts in the course.

270. International Business Transactions (2) I, Hillman

Discussion—2 hours. Consideration of selected problems in international business transactions.

271. Labor Law Seminar (2) II, Bartosic

Seminar—2 hours. Study of current questions from a critical legal studies perspective, 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). Limited enrollment.

***272. Family Law (Long Course) (3)**

Discussion—3 hours. Designed for the student with a substantial interest in Family Law. Emphasizes the legal, social and emotional aspects of parent-child relationships, including decisions concerning medical care, neglect, dependency, abuse, foster care, termination of parental rights, adoption, artificial insemination, surrogacy, paternity, legitimacy, surnames, birth control, abortion, child support and child custody. How attorneys, mental health professionals and the judicial process do and should deal with these issues (e.g., interviewing, counseling and mediation) are also considered.

273. Current Issues in Family and Marital Property (2) II, Bruch

Seminar—2 hours. Prerequisite: course 225, course 230 or 272, or consent of instructor. Examination in depth of important current issues in the fields of family and marital property law. Heavy emphasis on law reform, including study and direct observation of the legislative process. Each student will select one issue for development and presentation in the seminar. A research paper or draft bill and supporting analysis is required. A more lengthy paper with additional unit credit may be arranged with consent of instructor to satisfy the legal writing requirement.

***274. Intellectual Property (2)**

Discussion—2 hours. Study of the protection of intellectual property and unfair competition. Among the topics considered are trade secrets, patents, trademarks, misleading and false advertising, and copyrights.

276. The Juvenile Justice Process (2) II, Feeney

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. The law on Indian lands, waters, and fishing and hunting rights will also be emphasized.

***279. Public Sector Labor Law (2)**

Seminar—2 hours. Prerequisite: course 251 or consent of instructor. Application of private sector labor law doctrines to the public sector. Emphasis is on the four California public sector statutes and the impact of constitutional law on public employees. Class presentation and seminar paper will satisfy advanced writing requirement. Limited enrollment.

280. Advanced Legal Writing Seminar (2) I, 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)**

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 such topics as paternity and legitimacy; custody, foster care, and adoption; juvenile court proceedings; rights to support, health, birth control and education; legal capacity and emancipation.

***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.

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 (2) II, Parnas

Discussion—2 hours; field trips. Essential to those who wish to handle criminal cases. In particular, it treats bail, prosecutorial discretion, plea bargaining, trial by jury, and sentencing. Strongly suggested prior to doing a criminal clinical. Guest speakers. (Course 227 need not be taken before this course.)

285. Environmental Law (3) I, Dunning

Discussion—3 hours. Introduction to the law on environmental protection. Emphasis is placed on pollution control, particularly the Clean Air Act, the clear Water Act and various other statutes dealing with toxics. Generic environmental protection statutes such as the National Environmental Policy Act and the California Environmental Quality Act are also studied.

***286. Law and Economics (2) I.**

Seminar—2 hours. Course will examine a number of legal issues using economic analysis. Possible topics include the economic consequences of liability rules, economic analysis of contract law, theory of the firm and basic economics of corporate law and antitrust, the theory that the common law is efficient, and economic interpretations of basic concepts of Anglo-American law such as rights, property, harm, and equality. Prior background in economics is welcome but not necessary. Class presentation and seminar paper will satisfy the advanced legal writing requirement.

287. Public Land Law (2) II, 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)**

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 judicial 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. Limited enrollment.

***290. Criminal Justice Administration Seminar (2) II, 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. Class presentation and required seminar paper will satisfy the advanced legal writing requirement.

291. Mexican-American Legal Relations (3) I, Smith

Discussion—3 hours; final examination or research paper on approval by instructor. Course will include a description

and juridical analysis of the differences and similarities of the legal and political systems of the two countries; a survey of the legal aspects of doing business in Mexico; foreign investment; Mexico's external debt; trade (including imports and exports, oil, the GATT, technology transfer and intellectual property); selected bilateral and multilateral treaties, executive agreements and regional international law (The Organization of American States) regarding drug trafficking. Territorial extension into the adjacent oceans, and human rights; legal problems of the border and the relevance of law and development theory to economic, social and political change in Mexico.

***292. Immigration Law and Procedure (3)**

Seminar—3 hours. Course will survey a brief history of U.S. immigration and policy and compare the policies of other countries; use of primary and secondary sources of 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 relationship critical to securing favored immigrant status; deportation procedures; discretionary relief available to persons otherwise subject to deportation; available defenses to deportation and exclusion proceedings; 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. Agricultural Labor Law (2)**

Seminar—2 hours. Prerequisite: course 251 or consent of instructor. Application of labor law doctrines developed under the National Labor Relations Act to the agricultural sector. The focus of the course will be California's Agricultural Labor Relations Act, examining the similarities and differences between agricultural labor law and national private sector labor law. Class presentation and seminar paper required. Satisfies advanced legal writing requirement.

***294. Selected Topics in Private Land Use Planning Arrangements (2)**

Seminar—2 hours. Study of private land use planning arrangements and the real property seritudes used to implement them. Topics will vary each year. Class presentation and required seminar paper will satisfy the advanced legal writing requirement. Limited enrollment.

***295. Advanced Civil Procedure (2)**

Discussion—2 hours. Treatment of in-depth topics introduced in the basic civil procedure course and characteristic of modern multiparty, multclaim litigation. Areas studied include joinder of parties in complex federal court litigation, class actions, discovery, judicial management of litigation, multidistrict litigation in federal courts, and preclusion (*res Judicata* and *collateral estoppel*). Not all topics will be covered in any one semester.

***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, and the rights of privacy and publicity.

297. Pretrial Skills (2) I, Bernhard, Perschbacher

Discussion—2 hours. Course uses a series of role-playing exercises and class discussions to introduce students to a set of nontrial skills basic to the practice of law. Course concentrates on client interviewing and counseling but also includes exercises in witness interviewing, negotiation, and drafting of pleadings. 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 se-

master); (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. Appellate Advocacy (Moot Court) (1) I, Perschbacher Program includes classroom instruction in appellate procedure and appellate advocacy skills and participation in the moot court program. Participants in 410A work on three oral advocacy problems and argue six times before a moot court. Both courses, 410A and 410B, must be taken in order to qualify for interschool competitions. Limited enrollment. (S/U grading only.)

410B. Appellate Advocacy (Moot Court) (1) II. Perschbacher Prerequisite: course 410A. Continuation of course 410A. Participants in 410B research and write an appellate brief and argue the case twice before a moot court. Both courses, 410A and 410B, must be taken in order to qualify for interschool competitions. Limited enrollment. (S/U grading only.)

413. Interschool Competition (1-3) I, II. The Staff

Prerequisite: courses 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 (1-2) I and/or II.

Writing of an editorship quality law review article under the editorial supervision of editors of the *Law Review*. Minimum of 40 hours contribution to the *Review's* publication is also required. Credit may be obtained only upon achieving status as a Member of the *Law Review*, which requires that the student have made substantial progress toward completing an editorship article. Credit is awarded only after certification by the Editor-in-Chief of the *Law Review* and approval of the faculty advisers to the *Law Review*. (S/U grading only.)

417. Law Review Editor (2) I, II. The Staff

Editors must have completed an editorship article and must perform editorial duties requiring a substantial time commitment. Credit 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.)

418. Environs Editor (1) I, II. The Staff

The Editor-in-Chief of *Environs* may receive one credit for each semester of service. Credit must be approved by the faculty adviser to *Environs*. Only one person may receive this credit in any one semester. (S/U grading only.)

419. Advanced Writing Project (1-4) I, II. The Staff

Completion of a writing project under the active and regular supervision of a faculty member in satisfaction of the legal writing requirement. Writing project must be an individually authored work of rigorous intellectual effort of at least 20 typewritten, double-spaced pages, excluding footnotes. Project may take any of several forms, for example, a paper, a brief, a memorandum of law, a proposed statute, a statutory scheme or set of administrative regulations (with explanatory comments), or a will or agreement (with explanatory comments). Advanced writing project may also be undertaken in connection with another course or seminar to satisfy the legal writing requirement. Number of units for the writing project shall be approved by the faculty supervisor and will depend upon the scope of the writing effort. (Grading may be on S/U or letter-grade basis at the faculty supervisor's discretion.)

420. Individual Clinicals (2-12) I, II. The Staff

Individual Clinical Program—4 hours (1 unit) to full time (12 units). Prerequisite: to be arranged with practicing attorneys and public agency of student's choice with approval of Clinical Committee and under sponsorship of faculty member; relevant substantive and procedural courses recommended. Clinical must be under appropriate legal supervision and designed to maximize educational benefits. Students arranging individual clinicals in subject matter areas covered by Formal Clinical Programs (e.g., criminal justice, employment relations, legislative, immigration) must enroll in the Formal Clinical Program and attend the required seminars (see courses 234, 440, 455, 470). With exception of a clinical semester away, students may enroll in no more than 6 units in any one semester or any one clinical placement. With a full time

clinical semester away, one course may be taken in conjunction with course 420 with consent of Dean (14 semester units maximum total). For complete description of policies and procedure governing the design, approval, requirements and limitations of individual clinical, see "Clinical Guidelines" obtainable from Dean's Office or clinical office. (S/U grading only.) (Completed application and confirming letter from clinical placement must be submitted to Clinical Office one month prior to beginning of semester in which credit is requested.)

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 (2-12) 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. Only 2 units credit allowed students who have completed course 292. (S/U grading only.) Limited enrollment.

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, and to participate in occasional meetings of students enrolled in program. (S/U grading only.)

455. Clinical Program in Employment Relations (2-12) I, II.

West
Clinical Program. Practical experience in employment relations: private and public sector labor law, agricultural labor law, or 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 range of activities associated with their specific office, with emphasis on observation and participation in actual investigation, interviewing, drafting of pleadings, and attendance at hearings. Weekly journals and attendance at monthly small group meetings required. (S/U grading only.)

470. Clinical Program in the Administration of Criminal Justice (4-12) I, II. Feeney

Clinical program. Prerequisite: courses 219, 227 and 263A recommended. This program affords students the opportunity to gain practical experience working full or part time in a District Attorney's or Public Defender's office in one of several surrounding counties for a minimum of 13 office hours per week. Students enrolled in the program engage in the full range of activities associated with their specific office with emphasis on observation and participation in factual investigation, interviewing, counseling, negotiating, motion practice, and trials under State Bar rules. Journals and seminar attendance are required. Limited enrollment. May be repeated for a total of 12 units. (S/U grading only.)

495. Instruction in Legal Research and Writing Skills (2) I,

Bernhard; II, Bernhard, Johns
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)

Robert VanValin, Jr., Ph.D., Program Director
 Program Office, 922 Sproul Hall (752-9933)

Committee in Charge

- Wilbur A. Benware, Ph.D. (*German*)
- Nina F. Dronkers, Ph.D., Lecturer
- Caroline Henton, D.Phil. (*Linguistics*)
- Jeri J. Jaeger, Ph.D., Lecturer
- Maria I. Manea-Manoliu, Ph.D. (*French*)
- Almerindo E. Ojeda, Ph.D. (*Spanish*)
- Janet S. Shibamoto, Ph.D. (*Anthropology, Chinese and Japanese*)
- Lenora A. Timm, Ph.D. (*Linguistics*)
- Robert VanValin, Jr., Ph.D. (*Linguistics*)
- David P. Wilkins, A.B. (*Linguistics*)

Faculty

- Wilbur A. Benware, Ph.D., Associate Professor (*German*)
- Nina F. Dronkers, Ph.D., Lecturer
- Linnea C. Ehri, Ph.D., Professor (*Education*)
- James Gallant, Ph.D., Associate Professor (*Russian*)
- *Caroline Henton, D.Phil., Assistant Professor
- Jeri J. Jaeger, Ph.D., Lecturer
- Maria I. Manea-Manoliu, Ph.D., Professor (*French*)
- Barbara J. Merino, Ph.D., Associate Professor (*Education*)
- Michael T. Motley, Ph.D., Professor (*Rhetoric and Communication*)
- Almerindo E. Ojeda, Ph.D., Assistant Professor (*Spanish*)
- David L. Olmsted, Ph.D., Professor (*Anthropology*)
- Winfried Schleiner, Ph.D., Associate Professor (*English*)
- Gwendolyn Schwabe, M.A., Lecturer (*English*)
- Janet S. Shibamoto, Ph.D., Associate Professor (*Anthropology, Chinese and Japanese*)
- Carlton J. Spring, Jr., Ph.D., Professor (*Education*)
- Lenora A. Timm, Ph.D., Associate Professor
- Máximo Torreblanca, Ph.D., Professor (*Spanish*)
- Robert VanValin, Jr., Ph.D., Associate Professor
- Carolyn F. Wall, Ph.D., Associate Professor (*Anthropology*)
- Benjamin E. Wallacker, Ph.D., Professor (*Chinese and Japanese*)
- Michael V. Wedin, Ph.D., Professor (*Philosophy*)
- David P. Wilkins, A.B., Acting Assistant Professor

The Major Program

The discipline of linguistics encompasses a broad spectrum of knowledge about human language. Linguistics focuses on theories of language, description of contemporary languages, and the study of language change through time. It also has important applications within many other disciplines such as anthropology, biology, communications, education, language teaching, literature, philosophy, psychology, and sociology.

The 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:

Preparatory Subject Matter	UNITS
Linguistics 1	24-34
	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 44
 Linguistics 109, 110, 111, 139, 140, 165 24
 Linguistics 102 or 112 4
 Linguistics 100, 170, or Anthropology 220 (see College procedures governing undergraduate enrollment in a graduate course) 4

At least 12 upper division units from the following courses: 12
 Anthropology 117, 120, Education 117, 118, English 105A, 105B, French 159, 160, 161, Human Development 101, 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
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 68-78

Major Adviser. W.A. Benware.

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 Adviser. Same as Major adviser.

Graduate Study. The Linguistics Graduate Group offers study and research leading to the M.A. degree. Detailed information may be obtained from the Graduate Adviser or from the Chairperson of the Linguistics Group.

Graduate Adviser. A. E. Ojeda.

Courses in Linguistics

Lower Division Course

1. Introduction to Linguistics (4) I, II, III. Henton, Benware, Wilkins
 Lecture—3 hours; discussion—1 hour. Introduction to the study of language; its nature, diversity, and structure. General Education credit: Contemporary Societies/Introductory.

Upper Division Courses

100. Languages of East Asia (4) II. Wallacker
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Survey of languages and language families of East Asia, their natures and distributions.

102. Historical Linguistics (4) II. Wilkins
 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
 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. Henton
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1. Introduction to articulatory phonetics with some attention to the fundamentals of acoustic phonetics.

110. Elementary Linguistic Analysis (4) II. Olmsted
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Anthropology 4. Analytical techniques of articulatory phonetics, phonemics, morphophonemics, and morphology. (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, Gender and Society (4) III. Timm, Henton
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or Anthropology 4. Investigation of the nature and function of sex differences in communication (verbal and nonverbal language) on a cross-cultural basis. Significance of different communication patterns in considered in connection with theoretical models drawn from sociolinguistics, anthropology, and psychology. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Linguistics 1 or Anthropology 4.

114. The Ethnography of Speaking (4) I, Wall
 Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 4, or Anthropology 2 and course 1. Description and analysis of language usage in social context and of the sociocultural knowledge it reflects. Structure of speech events within communities: language in formal and informal contexts, ritual use of language, and linguistic means of marking social identity. (Same course as Anthropology 114.)

115. Chicano Sociolinguistics (3) II. Timm
 Lecture—3 hours. Prerequisite: course 1 and Spanish 3 or the equivalent. Study of the varieties of Chicano Spanish spoken in the Southwest. Patterns of Spanish-English bilingualism; attitudes about Spanish and English; Chicano Spanish and the schools. Offered in odd-numbered years.

120. Semantics (4) I, Wilkins
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Introduction to the study of meaning: the nature of the linguistic sign, the structure of the lexicon, and the semantics of sentences.

138. Language Development (4) III. Jaeger
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of the instructor. Theory and research on children's acquisition of their native language including the sound system, grammatical structure, basic semantic categories, and social aspects of usage.

139. Phonological Analysis (4) II. Henton
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. Introduction to and application of phonological theory.

140. Grammatical Analysis (4) I, VanValin, Wilkins
 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.

***150. Contrastive Analysis of Spanish and English** (4) III. Timm
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 and Spanish 3 or the equivalent. Comparison of the linguistic structures (phonology, morphology and syntax) of Spanish and English; learning problems of both native Spanish and native English speakers will be considered. Offered in even-numbered years.

165. Introduction to Syntactic Theory (4) II. Van Valin
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 140. Introduction to syntactic theory, primarily through the detailed study of a major theory of syntax, emphasizing theoretical reasoning, argumentation and theory building

169. Current Theories of Syntax (4) III. Ojeda, Van Valin
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 165. Examination of major contemporary theories of syntax.

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.

175. Biological Basis of Language (4) III. Dronkers
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Overview of issues in the field of

neurolinguistics and techniques used to explore representation of language in the human brain.

192. Internship in Linguistics (1-12) I, II, III. The Staff (Timm in charge)

Internship—3-36 hours; two written reports. Prerequisite: course 1 or the equivalent. Internship applying linguistic-related skills to a fieldwork project in areas such as media, law, or industry, in approved organizations or institutions. Maximum of 4 units applicable toward major. (P/NP grading only.)

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 (VanValin in charge)
(P/NP grading only.)

Graduate Courses

202. Principles of Historical Linguistics (4) III. Manea-Manoliu, Wilkins

Seminar—3 hours. Prerequisite: course 102 or 112. Advanced treatment of the theory and methods of historical linguistics. Offered in even-numbered years.

209. Advanced Phonetics (4) II. Henton

Lecture—3 hours; discussion—1 hour. Prerequisite: course 109. Exploration of the physiological basis of speech articulation and an introduction to acoustic phonetics. Offered in odd-numbered years.

***215. Computational Linguistics (4) I.** The Staff

Lecture—3 hours; term paper. Prerequisite: course 165 or consent of instructor; course 120 recommended. Applications of computers and the computational paradigm to the analysis and description of the syntax and semantics of language. Models of human performance in the use of language. Offered in odd-numbered years.

220. Romance Linguistics (4) II. Manea-Manoliu

Seminar—3 hours. Prerequisite: one course from the following: courses 112, 139, 140. The development of the major Romance languages from Proto-Romance to the modern era. Selected topics in the structure of modern Romance languages. Option of focus on phonology, syntax or historical linguistics.

***225A. Modern Linguistic Theory: Structuralism (4) II.** VanValin
Seminar—3 hours; term paper. Prerequisite: courses 139, 140. Survey of the development of structural linguistics from deSaussure to the 1950's. Offered in even-numbered years.

***225B. Modern Linguistic Theory: Generative Grammar (4) III.** VanValin, Ojeda

Seminar—3 hours; term paper. Prerequisite: courses 139, 165. Survey of the development of generative grammar and its offshoots from the 1950's to the present. Offered in even-numbered years.

239. Advanced Phonological Theory and Analysis (4) III. Henton

Lecture—3 hours; term paper. Prerequisite: course 139. Critical overview of current phonological theories. Offered in odd-numbered years.

250A-250B-250C-250D. Topics in Linguistic Theory and Methods (4-4-4-4) I, II, III. The Staff

Seminar—3 hours; paper. Prerequisite: graduate standing and consent of instructor. Introduction to current research in various aspects of linguistics.

265. Advanced Syntactic Theory and Analysis (4) III. VanValin

Lecture—3 hours; term paper. Prerequisite: course 165. Critical survey of contemporary theories of syntax, with concentration on functionalist theories. Offered in odd-numbered years.

280. Theory of English as a Second Language (4) I. The Staff

Lecture—3 hours; term paper. Theoretical issues that have influenced the teaching of English as a second language. Contributions of collateral disciplines—psycholinguistics, sociolinguistics, and cognitive psychology—to English as a second language instruction.

281. Research on Second Language Acquisition (4) II. Merino

Lecture—2 hours; laboratory—1 hour; term paper; computer projects. Prerequisite: upper division or graduate standing. Analysis of theory/research on L2 acquisition. Topics include: contrast of L1/L2 acquisition; current theories of L2 such as the natural order and input hypotheses, as well as effects of individual variation, cognition, motivation on L2; research design and basic statistical analyses.

282. Individual and Social Aspects of Bilingualism (4) I. Timm
Lecture—3 hours; term paper. Broad overview of bi- and multilingualism, with focus on theoretical and descriptive research; topics covered range from language processing in bilinguals to code-switching to language as political issue in multilingual states.

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 (VanValin 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)

Robert VanValin, Jr., Ph.D., Chairperson of the Group (752-7555)

Group Office, 922 Sproul Hall (752-9933/1219)

Faculty. The Group includes faculty from eleven departments in the College of Letters and Science.

Graduate Study. The Graduate Group in Linguistics offers a program of study leading to the M.A. degree. There are two tracks within the program, one concentrating on applied linguistics and TESOL, and the other on general linguistics. Within the general linguistics track, the following areas are emphasized: (a) theoretical linguistics, (b) sociolinguistics, (c) child language development, (d) psycholinguistics, (e) neurolinguistics, and (f) linguistic description (contemporary or historical) of a particular language or group of languages.

In general, the M.A. in Linguistics at UCD is intended to serve as preparation for advanced graduate work at the Ph.D. level, as a supplement to studies in related fields—especially anthropology, psychology, philosophy, the various languages, or as a major component in the training for a professional career (such as TESOL, speech therapy, and foreign language teaching). The program is structured so as to place considerable emphasis on interdisciplinary studies, thereby increasing the breadth of the candidate's knowledge, and providing a wider and more flexible variety of options to pursue thereafter.

Preparation. Applicants to the M.A. program who do not have a bachelor's degree in Linguistics must complete the following courses in Linguistics from the undergraduate program: 109 (phonetics), 110 (elementary analysis), 111 (intermediate analysis), 102 or 112 (historical or comparative linguistics), 139 (phonological analysis), 140 (grammatical analysis), and 165 (introduction to generative grammar).

Requirements. The requirements for the two tracks differ. The track in applied linguistics and TESOL operates under the Plan II program. Thirty-six units of upper division and graduate coursework above and beyond the prerequisite courses listed under Preparation (above) are required, and at the end of the coursework a student must pass a written comprehensive examination. The track in general linguistics falls under the Plan I set of requirements. Thirty units of upper division and graduate coursework above and beyond the prerequisite courses must be completed, and a thesis is required. Students in both tracks must pass a foreign language reading examination.

Graduate Adviser. A. E. Ojeda (Spanish).

Literature in Translation

The following courses are open to students throughout the campus. The readings can be in English. Refer to departmental listing for the course description.

Chinese

10. Modern Chinese Literature

Classics

- 140. Homer and Ancient Epic
- *141. Greek and Roman Comedy
- *142. Greek and Roman Novel
- 143. Greek Tragedy

Comparative Literature

- 1. Great Books of Western Civilization: From Myth to Faith
- 2. Great Books of Western Civilization: From Faith to Reason
- 3. Great Books of Western Civilization: The Modern Crisis
- *4. 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
- 53A. Literature of China and Japan
- *53B. Literature of India and Southeast Asia
- 135. Women Writers
- 157. War and Peace in Literature
- *159A-G. Special Topics in Comparative Literature
- *160A. The Modern Novel
- 160B. The Modern Drama
- *161A. Tragedy
- *161B. Comedy
- 163. Biography and Autobiography
- *164A. The Middle Ages
- 164B. The Renaissance
- *164C. Baroque and Neoclassicism
- 164D. The Enlightenment
- 166A. The Epic
- 166B. The Novel
- *167. Comparative Study of Major Authors
- 168A-C. Modern Literary Movements and Styles
- *169. The Avant-Garde

Dramatic Art

- 20. Introduction to Dramatic Art
- 156. Theatre and Drama: Aeschylus to Machiavelli
- 157. Theatre and Drama: Shakespeare to Schiller
- 158. Theatre and Drama: Ibsen to Albee
- 159. Contemporary Experimental Theatre and Drama

English

- *171A. The Bible as Literature: The Old Testament
- 171B. The Bible as Literature: Prophets and New Testament.

French

- 25. Introduction to French Literature
- 112. Masterpieces of French Drama
- 113. Masterpieces of French Novel
- 114. French Philosophical Literature
- *150. Masterpieces of French Literature

German

- 48. Myth and Saga in the Germanic Cultures
- *50. Survey of German Culture

- 51. Introduction to Literary Analysis
- 52. Masterworks of German Literature
- *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. The Faust Tradition before and after Goethe
- 115A. German Literature since 1945
- *115B. German Literature since 1945
- 116. From Goethe's *Werther* to Today's *Werthers*
- *117A. The Tristan Tradition: Medieval, Musical, Modern

Italian

- 25. Italian Literature in Translation
- *139A. Early Italian Literature and Dante Alighieri
- 139B. Boccaccio, Petrarch and the Renaissance
- *139C. Modern Italian Literature

Native American Studies

- 181A. Native American Literature (the novel and fiction)
- 181B. Native American Literature (non-fiction works by native authors)
- 181C. Native American Literature (traditional literature and poetry)

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

Management, School of

Michael Maher, Ph.D., Acting Dean
 School Office, 308 Voorhies Hall
 (752-7362/7363)

Faculty

- Jack Barbash, Ph.D., Visiting Professor
- Nicole W. Biggart, Ph.D., Associate Professor
(Management, Sociology)
- David S. Bunch, Ph.D., Assistant Professor
- Richard P. Castanias, Ph.D., Assistant Professor
- Richard C. Dorf, Ph.D., Professor
(Management, Electrical and Computer Engineering)
- George Frankel, J.D., Lecturer
(Management, Law)
- Paul A. Griffin, Ph.D., Professor
- Michael Hagerty, Ph.D., Associate Professor
- Herbert E. Johnson, Ph.D., Associate Professor
- Michael Maher, Ph.D., Professor
- Alexander F. McCalla, Ph.D., Professor
(Agricultural Economics)
- David M. Rocke, Ph.D., Professor
- Arthur M. Sullivan, Ph.D., Associate Professor
(Management, Economics)

- Jerome J. Suran, B.S., Ph.D. (hon.), Senior Lecturer
(Management, Electrical and Computer Engineering)
- Donald M. Topkis, Ph.D., Associate Professor
- Gary M. Walton, Ph.D., Professor
(Management, Economics)
- William E. Wecker, Ph.D., Professor

Courses in Management

Graduate Courses

(Core Courses)

- 200. **Financial Accounting and Reporting** (3) I. The Staff
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Principles of accounting, financial reporting and policy, with special attention to preparation, analysis, and evaluation of published corporate financial statements. Topics include income measurement and valuation, assets and liabilities, owner's equity, and intercorporate investments.
- 201. **Management Accounting and Control** (3) II. The Staff
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; course 200. Introduction to preparation, analysis, and evaluation of data provided by cost accounting for management planning and control, budgeting, performance evaluation and investment decision making. Topics include accumulating and allocating costs, nonprofit organizations, cost-volume-profit analysis, and capital investments.
- 202. **Organizational Behavior** (3) II. Biggart
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Introduction to analysis of social process within organizations. Topics include group dynamics, informal relations, leadership theories, socialization processes, power and conflict, goal setting, decision making, and organizational culture. Consideration alternative theoretical models.
- 203. **Organization Theory** (3) III. The Staff
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; course 202. Analysis of structural properties of organizations including differentiation, integration, and alternative structural configurations. Examination of technological and sociotechnical constraints on organizations. Organization-environment relations, organizational change.
- 204. **Economic Analysis I** (3) I, Sullivan
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; introductory knowledge of microeconomics. Economic reasoning applied to resource-allocation decisions of consumers, firms, and governmental bodies. Market forces and the price system. Corporate strategy and industrial organization.
- 205. **Economic Analysis II** (3) II, Sullivan
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; course 204. Continuation of course 204. Analysis of forces behind the supply of capital and labor. Examination of market efficiency, externalities, market failure, and public-policy responses to market failure.
- 206. **Evaluation of Policies and Programs** (3) III, Rocke
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Quantitative procedures for assessing the efficiency, effectiveness of policies and programs. Methodologies employed include experimental, quasi-experimental design, time series analysis. The advantages and limitations of various kinds of evaluation methods through case studies.
- 207. **Financial Theory and Policy** (3) III, Castanias
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; courses 204, 205. Intertemporal allocations of scarce resources by individuals, firms, and society when alternatives are risky. Factors which affect the valuation of risky short, long-run real, and financial assets. Financial policy, financial planning for profit-seeking, and not-for-profit organizations.
- 208. **Marketing Management** (3) III, The Staff
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Marketing management process, analysis of market opportunities, elements of market research, development of marketing strategies, market planning, implementation, and control systems. Consumer and industrial markets, market segmentation, pricing strategies, distribution channels, promotion, sales.
- 209. **Computers and Information Systems** (3) I, Rocke
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Introduces student to computer, develops programming and data handling skills. Studies use of computer in organizations, emphasis on managerial aspects of computing. Topics include standard and nonstandard uses of data files, centralization versus decentralization of computing, office automation, computer security.
- 210A. **Statistics for Management** (3) I, Wecker
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; course 209. Introduction to statistics for managerial decision making. Descriptive statistics, sampling, statistical inference, hypothesis testing.

- 210B. **Statistics for Management** (3) II, Wecker
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; courses 209 and 210A. Regression analysis and time series. Stresses applications of the techniques to problems in public and private administration.
- 211. **Quantitative Analysis for Decision Making** (3) III, Bunch
 Lecture—3 hours. Prerequisite: graduate standing or consent of instructor; course 210. Quantitative decision making. Decision analysis and mathematical modeling of complex decision processes. Linear programming, optimization, and simulation. Stresses applications of decision analysis in public and private administration.

(Second-Year Courses)

- Students must complete the Management core course requirement before enrolling in any of the following courses, or petition with consent of the instructor.
- 215. **Law and Legal Process** (3) I, The Staff
 Lecture—3 hours. Introduction to law and legal process in the United States. Sources of law. Structure and operation of courts, federal-state relationships, fundamentals of administrative law, fundamentals of business law.
 - 220. **Public Budgeting and Finance** (3) I, The Staff
 Lecture—3 hours. 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) III, Biggart
 Lecture—3 hours. Problems of recruiting, training, motivating, compensating, and separating workers in contemporary organizations. Topics include design of incentive systems, career management, professionalization, alienation, worker burnout, organizational deviance, and current issues such as affirmative action and the unionization of public employees.
 - 225. **Labor Relations** (3) II, Barbash
 Lecture—3 hours. Course deals with labor organization, employment relationships, employer-employee negotiations, contracts, and litigation. Worker and management rights, and collective bargaining in the public and private sectors will be explored.
 - *228. **Private and Public Sector Productivity Analysis** (3) I, Rocke
 Lecture—3 hours. 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 and Public Policy** (3) III, The Staff
 Lecture—3 hours. Identification and application of techniques of policy analysis to public sector issues and activities: emphasis on regulation and government interventions in the private sector.
 - *231. **Intergovernmental Systems and Administration** (3) III, The Staff
 Lecture—3 hours. Intergovernmental dimensions of public management, particularly how policies and programs of higher levels of government shape the actions of 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) III, The Staff
 Lecture—3 hours. Analysis of public policy in an urban setting, focusing on the efficiency effects of such policies. Topics include urban spatial structure, growth-management policies, housing, transportation, environmental quality, local government finance, and urban planning.
 - 233. **Regulation and Policy in Agriculture** (3) I, The Staff
 Lecture—3 hours. Implications for management of regulation and public policy on agricultural production choices, practices, processing, and marketing; influences on management strategy, organization, business practices, and resource productivity; trends in regulation and policy and their potential for management strategies are explored.
 - *234. **Urban Economics and Real Estate** (3) The Staff
 Lecture—3 hours. Applies economic reasoning to managerial decisions concerning the siting of firms and public agencies. Examines institutional setting and alternative strategies for real-estate finance and development. Examines impact of public policy on location decisions of firms.
 - 240. **Management Policy** (3) II, Suran
 Lecture—3 hours. Integrative examination of managing the total organizational enterprise. Missions, objectives, strategies, policies, measurements and controls; case studies.
 - 241. **Managerial Decision Making** (3) I, Bunch
 Lecture—3 hours. Develops analytical skills for evaluating

decisions and solving problems in various managerial settings. Emphasis is on problem structuring, decision analysis, and implementation. Course examines individual decision strategies, group processes, and organizational decision making.

242. Competitive Analysis (3) III. Bunch
Lecture—3 hours. 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. 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. 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. Examines process by which organizations develop strategic marketing plans. Includes definition of activities and products, marketing audits, appraising market opportunities, design of new activities and products, and organizing marketing planning function. Applications to problems in private and public sector marketing.

249. Marketing Research (3) III. The Staff
Lecture—3 hours. Course addresses the managerial issues and problems of systematically gathering and analyzing information for making private and public marketing decisions. Covers the cost and value of information, research design, information collection, measuring instruments, data analysis, and marketing research applications.

250. Technology Management (3) I. Dorf
Lecture—3 hours. Management of the engineering and technology activity. Functions of design, planning, production, marketing, sales, and maintenance. Technological product life cycle. Research and development activity. Project planning and organization. Manufacturing issues. Case studies.

251. Planning for the Technological Enterprise (3) II. Suran
Lecture—3 hours. 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) III. Wecker
Lecture—3 hours. Explores methods of increasing operational efficiency in production and service organizations through planning and scheduling, materials management, inventory control, quality control, and distribution. Methodologies employed include such techniques as programming, simulation, systems analysis, queuing, and network models.

260. Financial Management (3) II. Castanias
Lecture—3 hours. Focuses on planning, acquiring, and managing a company's financial resources. Includes discussion of financial aspects of mergers and other forms of reorganization; analysis of investment, financial, and dividend policy; and theories of optimal capital structure.

261. Investment Analysis (3) I. Johnson
Lecture—3 hours. Examines modern asset pricing theory and the implications of that theory for the analysis and management of stocks, bonds, and other financial securities. Factors influencing the value of stocks, bonds, options, warrants, and other securities are discussed from the perspective of a portfolio fund manager.

262. Money and Security Markets (3) I. The Staff
Lecture—3 hours. 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. Johnson
Lecture—3 hours. Studies the behavior of options and futures markets; how public agencies, businesses, others use those markets. Studies nature of various strategies involving options, commodity, financial futures contracts. Price determination in options and futures markets is also examined.

264. Business Taxation (3) II. The Staff
Lecture—3 hours. Analysis of the impact of business taxation on investment, production, and finance decisions. Discussion of the relationship between business organization and tax liability. Course is not intended for tax specialists.

265. Theory of Financial Decision Making (3) III. Castanias
Lecture—3 hours. Prerequisite: course 207 or equivalent. Theory of financial decision making.

266. International Finance (3) II. Castanias
Lecture—3 hours. Prerequisite: course 207 or equivalent. Open economy macroeconomics, balance of payments theory, and financial decision making in multinational firms.

270. Corporate Financial Reporting (3) I. Griffin
Lecture—3 hours. Analyzes and evaluates contemporary issues in financial reporting and develops implications of those issues for business decision makers, investment managers, and accounting policy makers.

271. Accounting and Budgeting for Management Control (3) I. The Staff
Lecture—3 hours. Examines concepts and techniques of accounting and budgeting for management decision making in the private sector. Topics include cost control, capital budgeting, performance evaluation, and the effects of uncertainty in achieving management objectives.

272. Evaluation of Financial Information (3) III. Griffin
Lecture—3 hours. Studies how investors, creditors, others use accounting and other information in making rational investment, lending decisions. Emphasis is placed on the analysis of financial information in a variety of contexts. Where applicable, recent research in finance and economics is discussed.

273. Accounting and Reporting for Governmental and Non-profit Entities (3) III. The Staff
Lecture—3 hours. Concepts, methods, and uses of accounting and financial reporting by governmental and non-profit entities. Introduction to budgeting and performance evaluation, and accounting for entities such as hospitals, universities, and welfare agencies.

274. Auditing, Internal Control, and Public Accounting (3) III. The Staff
Lecture—3 hours. Prerequisite: completion of Management 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. Data and File Management (3) I. Topkis
Lecture—3 hours. Concepts of information storage and retrieval on digital computers. Emphasis on file structures and their uses within organizations; applications drawn from both the public and private sector.

281. Systems Analysis and Design (3) II. The Staff
Lecture—3 hours. Design and specification of computer based information systems. Applications systems development life cycle, use requirements and feasibility assessment, logical and physical design, program development and testing, conversion and implementation.

282. Discrete System Simulation (3) II. The Staff
Lecture—3 hours. Prerequisite: course 280. Computer simulation of discrete dynamical systems under uncertainty. Topics include model building, computer implementation, output interpretation, and sensitivity analysis. Applications to managerial decision problems stressed.

***283. Optimization Theory and Applications (3) II.** Topkis
Lecture—3 hours. Introduces applied optimization theory. Examines linear, nonlinear, discrete, and dynamic programming; optimality conditions; transportation, networks, and large-scale systems; and computer implementation. Applications are made to problems in private and public management.

284. Applied Linear Models for Management (3) I. The Staff
Lecture—3 hours. Covers regression, analysis of covariance, 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. Considers application of time series methods to evaluation and forecasting problems. Covers univariate and multivariate ARIMA models and transfer function models. Applications will be in such areas as economics, finance, budgeting, program evaluation, and industrial process control.

286. Telecommunications and Computer Networks (3) I. Topkis
Lecture—3 hours. Prerequisite: course 280. Communication system components; common carrier services; design and control of communications networks; network management and distributed environment; local area networks; data security in computer networks.

287. Database Systems (3) II. The Staff
Lecture—3 hours. Prerequisite: course 280. Hierarchical, network, and relational models for database systems. Design and implementation of models. Performance evaluation and benchmarking. Query structures and languages. Data security and integrity. Application to managerial decision making and decision support systems.

288. Special Topics in Management of Information Systems (3) II. Topkis
Lecture—3 hours. Managerial aspects of information systems.

Topics stressing applications in organizations chosen from: economics of computers and information systems, decision support systems, management of computer-based information systems, office automation.

***289. Computer Concepts and Software Systems (3) III.** The Staff
Lecture—3 hours. Prerequisite: course 280. Fundamental concepts of computer operation including computer architecture, machine language and assembly language, operating systems, and the operating environment for applications programs. Emphasis on microcomputer systems with managerial applications.

290. Seminar in Management (3) III.
Seminar—3 hours. Interdisciplinary case study of a real business or government enterprise.

298. Directed Group Study (1-5) I, II, III. The Staff
Prerequisite: consent of instructor.

299. Individual Study (1-12) I, II, III. The Staff
Prerequisite: consent of instructor. (S/U grading only.)

Master of Education (A Graduate Group)

James Grieshop, Ph.D., Chairperson of the Group

Group Office, 103 Academic Office Building-IV
(752-4360, mornings only)

Faculty. This interdisciplinary graduate group consists of faculty from departments such as Agricultural Engineering, Agronomy and Range Science, Animal Science, Applied Behavioral Sciences, Community Health, Consumer Science, Environmental Design, Environmental Horticulture, Nutrition, Plant Science, Textiles and Clothing

Graduate Study. The Master of Education Graduate Group is housed in the Department of Applied Behavioral Sciences. The program of study involves one of three areas: (a) organizational studies, (b) consumer studies, and (c) agricultural sciences. Students focus on a specialty within one of these areas. Generally, Master of Education (M.Ed.) degree students are preparing for leadership and professional roles in community and development education. They are prepared for professional roles in community and educational organizations related to planning, organizational change, and evaluation.

Requirements. The M.Ed. degree requires 36 units minimum of upper division and graduate courses. A minimum of 18 of these units must be graduate level courses; and at least 8 units must be related to research methods and/or statistics. Students submit a required Program of Study Plan in the area of intended specialization by the end of the first quarter of graduate study. A field project and comprehensive oral examination are required for completion of this degree.

Mathematics

(College of Letters and Science)

Marc S. Mangel, Ph.D., Chairperson of the Department

Doyle O. Cutler, Ph.D., Vice-Chairperson of the Department (Graduate Matters)

David W. Barnette, Ph.D., Vice-Chairperson of the Department (Undergraduate Matters)

Department Office, 565 Kerr Hall (752-0827)

Faculty

Henry L. Alder, Ph.D., Professor
Hubert A. Arnold, Ph.D., Professor Emeritus
George A. Baker, Ph.D., Professor Emeritus
Dallas O. Banks, Ph.D., Professor
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., Professor
 James R. Diederich, Ph.D., Associate Professor
 Allan L. Edelson, Ph.D., Professor
 Curtis M. Fulton, Ph.D., Professor Emeritus
 Robert D. Glauz, Ph.D., Professor
 Shirley A. Goldman, M.S., Lecturer
 Joel Hass, Ph.D., Assistant Professor
 Alan M. Hastings, Ph.D., 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
 Melven R. Krom, Ph.D., Professor
 Gary J. Kurowski, Ph.D., Professor
 Marc S. Mangel, Ph.D., Professor
 David G. Mead, Ph.D., Professor
 E. O. Milton, Ph.D., Associate Professor
 Donald A. Norton, Ph.D., Professor Emeritus
 Nikolaos S. Papageorgiou, Ph.D., Assistant Professor
 Washek F. Pfeffer, Ph.D., Professor
 Richard E. Plant, Ph.D., Professor
 Edward B. Roessler, Ph.D., Professor Emeritus
 G. Thomas Sallee, Ph.D., Professor
 Evelyn M. Silvia, Ph.D., Professor
 Sherman K. Stein, Litt.D. (hon.), Ph.D., Professor
 Robert W. Stringall, Ph.D., Associate Professor
 Takayuki Tamura, D.Sc., Professor Emeritus
 J. Blake Temple, Ph.D., Assistant Professor
 Abigail Thompson, Ph.D., Assistant Professor
 Craig A. Tracy, Ph.D., Professor
 Edward J. Tully, Jr., Ph.D., Associate Professor
 Howard J. Weiner, Ph.D., Professor
 Roger J.B. Wets, 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:

Preparatory Subject Matter	UNITS 36-40
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Mathematics 11 (or high school equivalent)	0-3
Mathematics 21A, 21B, 21C, 22A, 22B	18
Mathematics 22C or 36	3
Computer Science Engineering 30	4
Physics 8A	4
Additional non-Mathematics courses chosen from natural sciences	8

Depth Subject Matter	37-43
Mathematics 108 (should be taken prior to junior year), 115A	7
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 168, Computer Science Engineering 110, 122.

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) Two courses from Mathematics 114, 116, 125, 126, 145, 147	

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 72-81

Mathematics

B.S. Major Requirements:

Preparatory Subject Matter	UNITS 36-48
Mathematics 11 (or high school equivalent)	0-3
Mathematics 21A, 21B, 21C, 22A, 22B	18
Computer Science Engineering 30	4
Additional non-Mathematics courses chosen from natural sciences	8
Choose according to Track (see Depth Subject Matter) selected	7-15

Mathematics 22C, Physics 8A, 8B, 8C (Tracks 1, 2); Mathematics 22C or 36, Physics 8A (Track 3); Mathematics 22C or 36, Statistics 13 or 32 or 102 (Track 4).

Note: Strongly recommend that course 36 be taken during the freshman year; course 36 cannot be taken after course 108.

Depth Subject Matter	46-55
Choose one Track from the following four:	

Track 1: Preparation for Graduate Study in Mathematics

Mathematics 108, 126, 127A, 127B, 127C, 151A, 151B, 151C, 185A-185B	
Additional upper division mathematics to total minimum of 45 upper division units (12)	
Recommended: Mathematics 118A, 118B, 119, 141, 147	

Track 2: Applied Mathematics

Mathematics 118A, 118B, 119, 167	
Choose one course sequence from each of (a), (b), and (c)	
(a) Mathematics 121A-121B and 185A, or 127A-127B-127C	
(b) Two courses from Mathematics 128A, 128B, or 128C	
(c) Statistics 131A or Mathematics 131	
(d) Mathematics 139A-139B or 151A-151B-151C.	
(e) Mathematics 118A-118B-119, or 145, Computer Science Engineering 110, and 122	
(f) Approved electives (6 units)	

The electives should be chosen, in consultation with an adviser, from approved courses in

one of the following areas: engineering, computer science, life sciences, or some other physical science (not mathematics). Note that prerequisites to upper division courses should be taken early in student's program.

Track 3: Mathematics for Secondary Teaching

Mathematics 108, 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 (11-16)
 Recommended: Mathematics 168; Computer Science Engineering 110, 122.

Track 4: General Mathematics

Mathematics 108, 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) Two courses from Mathematics 114, 116, 125, 126, 145, 147	

Additional upper division mathematics to total minimum of 45 upper division units (20-27)
 Recommended: Mathematics 131, 185A, 185B; additional units in computer science.

Total Units for the Major 81-101

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, R. J. Buck, J. R. Diederich, R. D. Glauz, F. A. Howes, M. R. Krom, G. J. Kurowski, D. G. Mead, E. M. Silvia, S. K. Stein.

Special Area Advisers. R.J. Buck, J.R. Diederich, R.D. Glauz, M.R. Krom, G.J. Kurowski, D.G. Mead, E.M. Silvia, S.K. Stein.

Information for Undergraduates. Assistance in planning an undergraduate major program in mathematics should be obtained from a major adviser. In addition, students seeking information pertaining to the application of mathematics to the biological or social sciences or computer science may contact the appropriate special area adviser.

Students desiring preparation towards an A.B. degree for secondary teaching or general mathematics, or a B.S. degree for graduate study, biological sciences, physical sciences, secondary teaching, or general mathematics should consult an undergraduate adviser.

Prerequisite Credit. No student may repeat a course, if that course is a prerequisite for a course which has already been completed with a grade of C- or better.

Minor Program Requirements:

	UNITS
Mathematics	20
Upper division units in mathematics	
(exclusive of Mathematics 192, 197TC, 198, 199)	20
Three of these units could be from Mathematics 36.	

Teaching Credential Subject Representative. G. T. Sallee. See also under Teacher Education Program.

Graduate Study. The Department offers programs of study and research leading to the M.A., M.A.T., and Ph.D. degrees in mathematics. Detailed information regarding graduate study may be obtained by writing to the Graduate Adviser, Department of Mathematics.

Graduate Advisers. G. D. Chakerian, D. O. Cutler, A. M. Hastings, K. Kreith (M.A.T. degree), W. F. Pfeffer, C. A. Tracy.

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 Staff
Lecture—2 hours. The Staff
Lecture—2 hours. Basic concepts of trigonometry, including trigonometric functions, identities, inverse functions, and applications. Offered only if sufficient number of students enroll. Not open to Concurrent student enrollment. (P/NP grading only.) (There is a fee of \$30.)

D. Intermediate Algebra (no credit) I, II. The Staff
Lecture—3 hours. Basic concepts of algebra, designed to prepare the student for college work in mathematics, such as course 16A, or 21A. Functions, equations, graphs, logarithms, and systems of 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, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra and geometry. Study of development, applications and theory of mathematics in early civilizations. Mathematics from both an ancient and modern point of view. Problem solving and independent readings.

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. (Not open to students who have completed courses 16A-16B-16C or 21A-21B-21C.)

(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; an alytic 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. (Not open to students who have completed course 16B.) Students with Advanced Placement credit may not officially enroll (in Mathematics 21A) but may attend only on a space available basis with consent of the instructor.

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. (Not open to students who have completed course 16B.)

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. (Not open to students who have completed course 16C.) Only two units of credit will be allowed to 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. (Not open to students who have completed course 16C.)

21C. Calculus (4) I, II, III. The Staff
Lecture-discussion—4 hours. Prerequisite: course 21B or 21BH. Continuation of course 21B. Sequences, series, tests for convergence, Taylor expansions. Partial derivatives, total differentials. Applications to maximum and minimum problems in two or more variables. Definite integrals over plane and solid regions in various coordinate systems. Applications to physical systems.

21CH. Honors Calculus (4) III. The Staff
Lecture-discussion—4 hours. More intensive treatment of material covered in course 21C.

22A. Linear Algebra (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: nine units of college mathematics. Matrices and linear transformations, determinants, complex numbers, quadratic forms. (Courses 22A, 22B, 22C may be taken in any order. However, if enrolled in Physics 8 sequence, 8B-8C-8D, courses should be taken in reverse order, 22C, 22B, 22A.)

22AH. Honors Linear Algebra (3) III. The Staff
Lecture—3 hours. Prerequisite: course 22BH or consent of instructor. More intensive treatment of material covered in course 22A.

22B. Differential Equations (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 21C. Solutions of elementary differential equations.

22BH. Honors Differential Equations (3) II. The Staff
Lecture—3 hours. Prerequisite: course 22CH or consent of instructor. More intensive treatment of material covered in course 22B.

22C. Vector Analysis (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: course 21C. Vector algebra, vector calculus. Scalar and vector fields. Line and surface integrals. Green's theorem, Stokes' theorem, divergence theorem.

22CH. Honors Vector Analysis (3) I. The Staff
Lecture—3 hours. Prerequisite: course 21C or consent of instructor. More intensive treatment of material covered in course 22C.

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 Mathematics (4) I, II, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 21C. Rigorous treatment of abstract mathematics with the emphasis on developing ability to understand and present mathematics arguments.

***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 (3) I. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 22B, 22C. Derivation of partial differential equations; separation of variables; equilibrium solutions and Laplace's equation; Fourier series; method of characteristics for the one-dimensional wave equation; solution of nonhomogeneous equations.

118B. Partial Differential Equations: Eigenfunction Expansions (3) II. The Staff
Lecture—3 hours. Prerequisite: course 118A. Sturm-Liouville Theory; self-adjoint operators; mixed boundary conditions; partial differential equations in two and three dimensions; Eigenvalue problems in circular domains; nonhomogeneous problems and the method of eigenfunction expansions; Poisson's Equations.

118C. Partial Differential Equations: Green's Functions and Transforms (3) III. The Staff
Lecture—3 hours. Prerequisite: course 118B. Green's functions for one-dimensional problems and Poisson's equation; Fourier Transforms; Green's Functions for time dependent problems; Laplace transform and solution of partial differential equations.

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) III. 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 a knowledge of a programming language such as Pascal, FORTRAN or BASIC. Difference equations, operators, numerical solution of ordinary and partial differential equations.

131. Methods of Mathematical Probability (4) II. The Staff
Lecture—4 hours. Prerequisite: courses 21C and 22A. Probability space, event, combinatorics; discrete, continuous distributions; random variables; joint, marginal conditional densities; transformation; expectation; sums and moments; inequalities; laws of large numbers; central limit law; probability models via conditioning; tables. Students who have had Statistics 131A may not receive credit for this course.

132A-132B. Introduction to Stochastic Processes (3-3) III-I. The Staff
Lecture—3 hours. Prerequisite: course 131 or Statistics 131A. Markov chains, Poisson process, birth and death processes, renewal theory, queueing theory, Brownian motion, stationary processes.

139A. Introduction to Algebra (3) II. 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) III. 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.

145. Combinatorial Mathematics (3) III. The Staff
Lecture—3 hours. Prerequisite: course 108. Combinatorial methods using basic graph theory counting methods, generating functions, and recurrence relations.

***147. Topology (3) III.** 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.

160. Mathematical Foundations of Database Theory, Design, and Performance (3) I, Diederich
Lecture—3 hours. Prerequisite: course 108 and familiarity with one high level computer language. The relational model; relational algebra; relational calculus; normal forms; functional and multivalued dependencies. Separability. Cost benefit analysis of physical database design and reorganization. Performance via analytical modelling, simulation, and queueing theory. Block accesses: buffering; operating system contention; CPU intensive operations.

164. Mathematical Foundations of Fifth Generation Computing (3) II. Milton
Lecture—3 hours. Prerequisite: course 108 and a modern high-level computer language. Study of the uses of predicate and various logics in knowledge-based systems. Resolution and non-resolution deduction, forward and backward deduction systems, logic programming, symbolic integration, problem solving strategies, functions in search strategies, mathematical treatment of uncertainty in expert systems.

167. Linear Algebra and Applications (3) 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.

180. Special Topics: Pure and Applied Mathematics (2-3) I, II, III. The Staff
To be arranged by students and instructor. Prerequisite: course 22A-22B-22C or consent of instructor. Special topics from various fields of pure and applied mathematics. Topics selected based on mutual interests of students and faculty. May be repeated for credit in different subject area.

185A. Functions of a Complex Variable with Applications (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 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) III.** The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: course 185A or consent of instructor. Analytic functions, elementary functions and their mapping properties, applications of Cauchy's integral theorem, conformal mapping and applications to heat flow and fluid mechanics. Offered in 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.)

194. Undergraduate Thesis (3) I, II, III. The Staff
Prerequisite: consent of instructor. Independent research under supervision of a faculty member. Student will submit written report in thesis form. Maybe repeated with consent of Vice Chairperson. (P/NP grading only.)

197TC. Tutoring Mathematics in the Community (1-5) I, II, III. The Staff (Chairperson in charge)
Seminar—1-2 hours; laboratory—2-6 hours. Prerequisite: upper division standing and consent of instructor. Special projects in mathematical education which involve the development of techniques for mathematics instruction and tutoring on an individual or small group basis. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

201A-201B-201C. Real and Complex Analysis (4-4-4) I-II-III. The Staff
Lecture—3 hours; discussion or paper (instructor's option). Prerequisite: course 127C or 203C. Abstract integration, Lebesgue measures, L^p spaces, complex measures, holomorphic functions, Cauchy's theorem, Riemann mapping theorem, and analytic continuation.

201D. Real and Complex Analysis (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 201C. Riemann mapping theorem and analytic continuation.

202A-202B-202C. Functional Analysis (4-4-4) II-III-I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 201C. Topological vector spaces, Banach spaces, Hilbert spaces, linear and nonlinear operators, spectral theorem, fixed point theorems. Offered in odd-numbered years.

203A-203B. Modern Applied Analysis (3-3) I-II. The Staff
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Classical mathematical foundations leading to modern analysis. Linear and metric spaces; Hilbert space; operator theory. Applications to integral and differential equations. Variational methods.

203C. Modern Applied Analysis (3) III. The Staff
Lecture—3 hours. Prerequisite: course 203B. Applications to integral and differential equations. Variational methods.

204. Applied Asymptotic Analysis (3) I. The Staff
Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Asymptotic analysis and perturbation theory, with applications to optimization, differential equations, and scaling.

210A. Topics in Geometry (3) I. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced geometry related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210AL. Topics in Geometry: Discussion (1) I. The Staff (Chairperson in charge)
Lecture-discussion—1 hour (to be arranged). Prerequisite: course 210A (concurrently); consent of instructor. Special topics related to course 210A which are of special interest to teachers and candidates for M.A.T. degree program. May be repeated for credit.

210B. Topics in Algebra (3) II. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced algebra related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210BL. Topics in Algebra: Discussion (1) II. The Staff (Chairperson in charge)

Lecture-discussion—1 hour (to be arranged). Prerequisite: course 210B (concurrently); consent of instructor. Special topics related to course 210B which are of special interest to teachers and candidates for M.A.T. degree program. May be repeated for credit.

210C. Topics in Analysis (3) III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: bachelor's degree in mathematics or consent of instructor. Topics in advanced analysis related to curriculum at all levels. Required for M.A.T. degree program for prospective teachers. May be repeated for credit with prior consent of instructor.

210CL. Topics in Analysis: Discussion (1) III. The Staff (Chairperson in charge)
Lecture-discussion—1 hour (to be arranged). Prerequisite: course 210C (concurrently); consent of instructor. Special topics related to course 210C which are of special interest to teachers and candidates for M.A.T. degree program. May be repeated for credit.

***213A-213B-213C. Stochastic Dynamics and Applications (3-3-3) I-II-III.** The Staff
Lecture—3 hours. Prerequisite: course 201C or 235C or consent of instructor. Stochastic processes including Gaussian, Markov and stationary processes. Diffusion, martingales, stochastic differential equations. Applications and advanced topics. Offered in odd-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, homotopy theory, and homology theory. Offered in even-numbered years.

218A-218B. Partial Differential Equations (3-3) II-III. The Staff
Lecture—3 hours. Prerequisite: courses 22A, 127C. Topics from the theory of partial differential equations and integral equations. Offered in odd-numbered years.

***219A-219B. Ordinary Differential Equations (3-3) II-III.** The Staff
Lecture—3 hours. Prerequisite: courses 22A, 127C. Ordinary differential equations in the real and complex domains; existence and uniqueness theorems; linear systems; analysis of singular points; Sturm-Liouville theory; asymptotic expansions. Offered in even-numbered years.

***221A-221B. Mathematical Fluid Dynamics (3-3) I-II.** The Staff
Lecture—3 hours. Prerequisite: course 118B. Dynamics of fluid motion, perfect fluids, rotational and irrotational motion, two-dimensional and three-dimensional axisymmetric flows, compressible and incompressible viscous fluids. Offered in odd-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.

235A-235B-235C. Probability Theory (3-3-3) I-II-III. The Staff
Lecture—3 hours. Prerequisite: course 127C and courses 131A-131B or the equivalent. Measure theoretic foundations, abstract integration, modes of convergence, limit theorems, independence, laws of large numbers, characteristic functions, central limit theorem, conditional expectations; topics from discrete time Markov and stationary processes, ergodic theory, Brownian motion, weak convergence, Wiener and Poisson processes. Offered in even-numbered years. (Same course as Statistics 235A-235B-235C.)

***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.

270. Foundations of Optimization (3) I. The Staff

Lecture—3 hours. Prerequisite: course 203 or 127. Theory of Linear and Nonlinear Programming: convexity, optimality conditions, duality, approximation, subdifferentiability. Goal is to acquaint student with the basic tools to derive optimality (and equilibria) for optimization problems in finite dimensions. Offered in odd-numbered years.

270A-270B. Modern Methods of Operations Research (3-3) II-III. The Staff

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.

271. Dynamical Optimization (3) II. The Staff

Lecture—3 hours. Prerequisite: course 203 or 127. Calculus of variations, optimal control, Pontryagin's maximal principle, optimality principle of dynamic programming. Goal is to provide student with the mathematical foundations of control theory and the calculus of variations. Offered in even-numbered years.

272. Numerical Optimization (3) III. The Staff

Lecture—3 hours. Prerequisite: course 203 or 127. Unconstrained and constrained optimization, second order methods (Newton, quasi-Newton, sequential quadratic programming), large-scale optimization techniques, global optimization. Course goal is to acquaint student with the major techniques developed for optimization problems. Offered in even-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.)

***301A-301B. Mathematics Teaching Practicum** (3-3) I-II. 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. Curriculum Development in Mathematics** (1-1) I-II. 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. Mathematics Pedagogy** (1-1) I-II. 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 repeated for credit. (S/U grading only.)

Medical Microbiology

See Medicine, School of

Medicine

See Medicine (School of); and
Medicine (Veterinary Medicine)

Medicine, School of

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Dennis Styne, M.D., Associate Professor (*Pediatrics*)
Mao-Chang Su, M.D., Visiting Assistant Professor (*Orthopaedic Surgery*)
Glenn T. Syftestad, Ph.D., Associate Professor in Residence (*Orthopaedic Surgery*)
Michael Syvanen, Ph.D., Associate Professor in Residence (*Medical Microbiology and Immunology*)
Robert M. Szabo, M.D., Associate Professor (*Orthopaedic Surgery*)
Jeffrey L. Tanji, M.D., Assistant Professor (*Family Practice*)
Raymond L. Teplitz, M.D., Professor (*Pathology*)
Henry Tesluk, M.D., Professor of Clinical Pathology (*Clinical Pathology*)
Seth Thaller, M.D., Assistant Professor in Residence (*Surgery*)
Jerold H. Theis, D.V.M., Ph.D., Professor (*Medical Microbiology and Immunology*)
Charles E. Thirkill, Ph.D., Assistant Adjunct Professor (*Ophthalmology*)
Duane E. Townsend, M.D., Professor (*Obstetrics and Gynecology*)
Robert R. Traut, Ph.D., Professor (*Biological Chemistry*)
Colin R. Tredrea, M.B.B.S., Assistant Professor of Clinical Anesthesiology (*Anesthesiology*)
Correne E. Treguboff, R.N., F.N.P., Visiting Lecturer (*Family Practice*)
John D. Treford, M.D., Professor (*Obstetrics and Gynecology*)
Joann M. Trolinger, M.H.S., Visiting Lecturer (*Family Practice*)
Frederic A. Troy II, Ph.D., Professor (*Biological Chemistry*)
Walter Trudeau, M.D., 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., Professor (*Human Physiology*)
Patrick L. Twomey, M.D., Associate Professor in Residence (*Surgery*)
David Vera, Ph.D., Assistant Adjunct Professor (*Radiology*)
Zakauddin Vera, M.D., Associate Professor (*Internal Medicine*)
Vijaya K. Vijayan, M.D., Ph.D., Associate Professor (*Human Anatomy, Neurology*)
Philip J. Vogt, M.D., Assistant Professor of Clinical Pathology (*Clinical Pathology*)
Carolyn S. Waggoner, M.S., R.D., Adjunct Lecturer (*Internal Medicine, Nutrition*)
Franklin C. Wagner, M.D., Professor (*Neurological Surgery*)
Donal A. Walsh, Ph.D., Professor (*Biological Chemistry*)
Robert M. Walter, Jr., M.D., Associate Professor (*Internal Medicine*)
Richard F. Walters, M.D., Professor (*Family Practice*)
Richard E. Ward, M.D., Professor (*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 Emeritus of Clinical Internal Medicine (*Clinical Internal Medicine*)
Phillip G. Weiler, M.D., Professor of Clinical Community Health (*Clinical Community Health*)
Sefton R. Wellings, M.D., Ph.D., Professor Emeritus (*Pathology*)
Richard P. Wennberg, M.D., Professor (*Pediatrics*)
Robert T. Wertz, Ph.D., Adjunct Professor (*Neurology*)
Theodore C. West, Ph.D., Professor Emeritus (*Pharmacology*)
Ronald G. Wheeland, M.D., Associate Professor in Residence (*Dermatology*)
David A. White, M.D., Assistant Professor in Residence (*Anesthesiology*)
Lynda L. White, M.H.S., Lecturer (*Family Practice*)
Ralph W. deVere White, M.D., Professor (*Urology*)
Richard H. White, M.D., Associate Clinical Professor (*Internal Medicine*)
Connie Whiteside, M.D., Assistant Professor of Clinical Internal Medicine (*Internal Medicine*)
Lynn M. Wiley, Ph.D., Associate Professor in Residence (*Obstetrics and Gynecology*)
Hibbard E. Williams, M.D., Professor (*Internal Medicine*)
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 (*Anesthesiology, Pharmacology*)
David H. Wisner, M.D., Assistant Professor in Residence (*Surgery*)
Hanspeter Witschi, M.D., Professor in Residence (*Internal Medicine*)
Bruce M. Wolfe, M.D., Professor (*Surgery*)
Earl F. Wolfman, Jr., M.D., Professor (*Surgery*)
David L. Woods, Ph.D., Associate Adjunct Professor (*Neurology*)
Hiroshi Yamauchi, M.D., Professor of Clinical Internal Medicine (*Clinical Internal Medicine*)
Charles Chen-Siung Yang, M.D., Assistant Professor (*Physical Medicine and Rehabilitation*)
Julian R. Youmans, M.D., Ph.D., Professor (*Neurological Surgery*)
Vincent Ziboh, Ph.D., Professor (*Dermatology, Biological Chemistry*)

Admission Requirements and Professional Curriculum. Detailed information can be obtained from the School of Medicine. See also the School of Medicine section in the front portion of this catalog.

Courses in the School of Medicine

Curriculum for the School of Medicine

The curriculum for the M.D. degree at the University of California, Davis School of Medicine is a four-year program to provide comprehensive training for the practice of medicine. It offers a blend of basic science training and clinical experience with opportunities for research. While the first two years emphasize the basic science basis of medicine, the student is exposed even from the onset to questions of patient management, thus providing a natural transition from the entry pregraduate training into the clinical training of the final two years.

The first-year program is for three quarters, beginning in the Fall. The basic sciences (anatomy, physiology, biochemistry, immunology, general pathology) are blended with social sciences (the behavioral aspects of medicine), and students are introduced to the art of communicating with patients, and emergency medicine. The second-year program is for four quarters, but with the Summer Quarter abbreviated to six weeks. The Summer Quarter provides a transition between basic and clinical sciences with the presentation of systematic pathology, 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: eight weeks of surgery, twelve weeks of medicine, and eight weeks each of obstetrics/gynecology, pediatrics and psychiatry. In addition, four weeks of flexible time are available in the third year for electives or to meet one of the fourth-year program requirements. 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 ten weeks of required clerkships (four weeks surgical specialties; two weeks ophthalmology; two weeks otolaryngology; two weeks physical medicine and rehabilitation), two weeks required experience in the responsibilities of medical practice (medical ethics, jurisprudence, cost containment), twenty weeks of selected clerkships and an opportunity of up to twelve weeks of electives.

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 401, behavioral aspects of medicine	5
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

Internal Medicine 420A, hematopoietic and lymphoreticular system	4
Internal Medicine 420B, gastrointestinal system	3.5
Medical Microbiology 480B, pathogenic microbiology	7
Obstetrics and Gynecology/Pediatrics 420, reproductive system and perinatology	2
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
Dermatology 420, integumentary system	2
Internal Medicine 401A, physical diagnosis practicum	2
Internal Medicine 402, occupational medicine	1
Internal Medicine 420C, pathophysiology of respiratory system	4
Internal Medicine 420D, cardiovascular system	4
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, musculoskeletal 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 (12) I, II, III, IV. Course Committee Chairperson
Clinical Clerkship—full time (8 weeks). Prerequisite: third-year medical student and approval by Committee on Student Evaluation and Promotion. Student required to take four weeks in General Surgery. Course also includes instruction in Anesthesia.

431. 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. 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.

440. Responsibilities of Medical Practice (3) II. Tupper
Lecture-discussion—60 hours total. Prerequisite: approval by Committee on Student Evaluation and Promotion. Students will address nonbiological components of the patient-physician relationship (Medical ethics, medical jurisprudence, medical economics, alcoholism and drug abuse, etc.) and critically explore social, ethical and cultural issues arising in medical practice.

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 four weeks each in Ear, Nose, and Throat (ENT)/Eye (Otolaryngology 440 and Ophthalmology 440) and two weeks in Physical Medicine and Rehabilitation (Physical Medicine and Rehabilitation 440); four weeks of surgical specialties, twenty weeks of selectives; and twelve weeks of electives. The table below outlines the track system.

Track I: Surgical Specialties

	WEEKS
ENT/Eye	4
Physical Medicine and Rehabilitation	2
Surgical Specialties	4
Responsibilities of Medical Practice	2
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	2
Surgical Specialties	4
Responsibilities of Medical Practice	3
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	2
Surgical Specialties	4
Responsibilities of Medical Practice	2
Selectives	20
Internal Medicine or Pediatrics courses or combination thereof, (may include 4 weeks of Family Practice or Psychiatry) (12) Neurosciences (8)	
Electives	12

Other Medical Sciences Courses

Professional Courses

450. Introduction to UCD Medical Center (1) III. The Staff Seminar—20 hours total. Prerequisite: second-year medical student. Designed to assist medical student in transition from classroom to hospital setting. (S/U grading only.)

480. Insights in Clinical Research (1) II. Waish
Lecture—1 hour. Prerequisite: medical students in good standing. Clinical research presented by School of Medicine faculty; overview of pertinent issues, including medical ethics, human subjects protocols, case control methods, etc. (S/U grading only.)

489. 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 (Bennett, Kien)

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 (Hanowell 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 (White 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. The 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. Irwin

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.

462. Airway and Mechanical Ventilation Management (3) II, III. Mott and staff

Clinical clerkship—full time (2 weeks). Introduce medicine student to endotracheal intubation, regulation of mechanical ventilators, and weaning from ventilatory support.

480. Insights in Anesthesiology (1-3) I, II, III, IV. Fung

Clinical experience—3 to 9 hours. Prerequisite: first- and second-year medical students with good academic standing; consent of instructor. Observation of applied anatomy, physiology, and pharmacology; role of the anesthesiologists in the operating room as part of surgical team; preanesthetic and postanesthetic evaluation of patients. May be limited opportunity to be involved in procedures. (S/U grading only.)

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. 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. Gronert and staff

Laboratory—12-54 hours. Prerequisite: third- or fourth-year medical students, advanced standing undergraduate and veterinary medicine students; or consent of instructor. Problems in clinical and/or laboratory research. (S/U grading only for medical students.)

Biological Chemistry

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 biochemistry related to medicine. Material covered stresses concepts derived from biochemical research which have some potential clinical relevance. No examination. (S/U grading only.) (Same course as 414.)
- 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.)
- 217. Molecular Genetics of Fungi** (3) II. Holland
Lecture—3 hours. Prerequisite: graduate standing in a biological science; Biochemistry 101B, Genetics 100, 102; Botany 119, Plant Pathology 130, 215, Microbiology 215 recommended. Advanced treatment of molecular biology and genetics of filamentous fungi and yeasts, including gene structure, organization and regulation; secretion; control of reproduction; molecular evolution; transformation; and gene manipulation.
- 222. Mechanisms of Translational Control** (2) II. Hershey
Lecture—3 hours; discussion—1 hour. Prerequisite: Biochemistry 201C or consent of instructor. Molecular mechanisms of protein synthesis and translational control in eucaryotic cells, with emphasis on mammalian cells and their viruses. An advanced graduate-level treatment of topics of current interest, with readings and discussion of primary papers from the literature. Offered in even-numbered years.
- 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 of 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 Human Physiology 418.)
- 419. Introduction to Clinical Nutrition** (3) IV. Halsted, Rucker, and staff
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.)
- 497T. Tutoring in Biological Chemistry** (1-5) I, II, III, IV. The Staff
Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)
- 498. Group Study** (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: medical students with consent of instructor. (S/U grading only.)
- 499. Research** (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: medical students with consent of instructor. (S/U grading only.)

Clinical Psychology

Graduate Course

- 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. Orgren
Lecture—3 hours. Prerequisite: undergraduate standing. Covers comprehensively the responsibilities, obligations, roles and professional activities of various health care disciplines in the community; provides students with perspectives on preventive medicine in society.
- 160. Health Education** (1-5) I, II, III, IV. The Staff (Student Health Center)
Lecture—1-3 hours; laboratory—3-15 hours. Prerequisite: consent of instructor. Preparation for field work in the area of health education. Planning and presentation of programs on health issues. Peer counseling in the areas of sexuality and alcohol/drug abuse. (P/NP grading only.)
- 180. Aging and Health** (3) III. Orgren
Lecture—3 hours. Prerequisite: upper division standing and consent of instructor. Emphasis on nature and determinants of health in the elderly. Current social and personal strategies for enhancing and maintaining health in old age.
- 192. 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. Kumagai and 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

- 226. Psychiatric Implications of Legal Intervention** (2) I, III. Bauer
Discussion—2 hours. Prerequisite: consent of instructor. The influence of laws on human behavior, and vice versa, will be explored. Particular emphasis on youth and juvenile court procedure. (S/U grading only.) (Same course as Psychiatry 226.)
- 294. Practicum in Community Health Clinics** (1-5) I, II, III, IV. Kumagai
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. Borhani, Weiler, Tupper, Bauer
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. Weiler
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. Tupper and staff
Lecture—12 hours total; discussion—8 hours total. Prerequisite: consent by Committee on Student Evaluation and Promotion. Nature and control of environmentally dependent 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.
- 455. Multidisciplinary Clinical Preceptorship** (4½) IV. Orgren
Clinical experience—full time (3 weeks). Prerequisite: second-year student in good academic standing. Students will be introduced to basic principals of geriatric health care and provided with opportunities for clinical observation and experience in a variety of facilities that serve older adults. Multidisciplinary nature of geriatrics will be emphasized. (S/U grading only.)
- 460. Geriatrics in Community Health** (6-12) I, II, III, IV. 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 infirmed. Sites include Yolo, Sacramento and Martinez.
- 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.)

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.

468. Health Care Delivery in the Emergency Service (5-18) I, II, III, IV. Borhani, Smilkenstein

Prerequisite: third- or fourth-year medical student. Student participation under faculty supervision in assessment of EMS needs through survey procedures, inventory of alternative resources and evaluation of EMS delivery systems. Course offered jointly with Department of Family Practice.

480. Insights in Community Health (1-3) I, II, III, IV. Weiler
Clinical experience—3-9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Introduction to concepts involved in clinical practice of geriatrics. Participation in multi-disciplinary team conferences and teaching conferences, nursing home rounds, home health visits and hospice care, as well as other geriatric services. (S/U grading only.)

Dermatology**Upper Division Courses**

192. Internship in Cutaneous Biology (1-4) I, II, III, IV. Isseroff
Work-learn experience—8-20 hours; final report. Prerequisite: upper division standing or consent of instructor. Approval of project prior to internship by preceptor. Supervised work-learn experience involving research on the skin. (P/NP grading only.)

199. Special Study in Cutaneous Biology (1-4) I, II, III, IV. The Staff (Isseroff in charge)

Prerequisite: advanced undergraduate standing and/or consent of instructor. Special study by individual arrangement of specialized topics in biology of skin. Work may be assigned readings, laboratory research or a combination. (P/NP grading only.)

Professional Courses

420. Integumentary System (2) II. Huntley and staff

Lecture—20 hours, discussion-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. Isseroff

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, Kaiser, and private practitioner offices. Limited Enrollment.

480. Insights in Dermatology (1-3) I, II, III, IV. Gomez

Clinical experience—3-9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Clinical experience limited to observation of delivery of dermatologic care and attendance at some conferences. (S/U grading only.)

498. Special Topics in Clinical Dermatology (1-6) I, II, III, IV. The Staff (Gomez 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 (Gomez in charge)

Individually arranged study of special topics in cutaneous biology selected by student and instructor.

Family Practice**Lower Division Courses**

92B. Health Science Hospital Practicum (3-5) I, II, III, IV. Smith

Field work—in hospital setting. Prerequisite: interest in health-care delivery and consent of instructor. Field experience course for lower division students. Emphasizes observation of and providing assistance to health professionals including physicians, nurses, therapists, technicians and administrative staff. Introduces many common hospital procedures and current health issues. Students complete CPR certificate. (P/NP grading only.)

92C. Health Science Clinic Practicum (2) I, II, III, IV.

Field work—in clinic setting. Prerequisite: consent of instructor. Field experience to expose lower division students to health-

care delivery including: patient histories and physical examinations; health promotion and disease prevention; diagnosis and treatment of episodic, acute and chronic illness; basic laboratory testing; and appropriate referral and follow-up. (P/NP grading only.)

Upper Division Courses

***110. Basic Office Skills for Primary Care Providers** (1) I, White

Discussion—1 hour; laboratory—1 hour. Techniques of basic office skills, medical terminology and the Physician Assistants law in California. (P/NP grading only.)

192A. Internship in Family Practice (1-12) I, II, III, IV. Davidson
Work-learn experience—3-36 hours. Prerequisite: upper division standing and consent of instructor. Work-learn experience supervised in the Department of Family Practice. Upper-division students provided an opportunity to acquire research experience in a clinical laboratory setting. (P/NP grading only.)

192B. Health Science Hospital Practicum (3 or 5) I, II, III, IV. Smith (Student Health Center)

Fieldwork—in hospital setting. Prerequisite: interest in health-care delivery; upper-division standing and consent of instructor. Field experience for upper-division students. Emphasizes observation of and providing assistance to health professionals including physicians, nurses, therapists, technicians and administrative staff. Introduced to many common hospital procedures and current health issues. Students complete CPR certificate. (P/NP grading only.)

192C. Health Science Clinic Practicum (2) I, II, III, IV. Arevalo

Field work—in clinic setting. Prerequisite: upper-division standing and consent of instructor. Field experience to introduce upper-division students to health-care delivery including: patient histories and physical examinations; health promotion and disease prevention; diagnosis and treatment of episodic, acute and chronic illness; basic laboratory testing; and appropriate referral and follow-up. (P/NP grading only.)

Graduate Courses

220. Basic Science in Cardiology (1) I. Kaufman

Lecture—1 hour. Prerequisite: graduate or medical student status. Fundamentals underlying cardiovascular medicine. Including hemodynamics, neural control of the circulation, biochemistry and some experimental design and statistics. Experts in each of these fields will give current information in their areas. Offered in even-numbered years. (S/U grading only.)

Professional Courses

The following courses are for students enrolled in the Family Nurse Practitioner/Physician Assistant Program.

319A-319B-319C-319D. Clinical Preceptorship for Mid-level Health Care Providers (FNP/PA) (5-6, 5-6, 5-6, 5-6) I-II-III-IV. The Staff

Lecture—1 hour; laboratory—16-24 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program; course 320A-320B-320C-320D 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.

323. Advanced Medicine for Family Nurse Practitioner/Physician Assistant (4) I, Morgan

48 hours per quarter—to be announced. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program; satisfactory completion of course 320A-320B-320C-320D. Extends the basics of primary care taught in course 320A-320B-320C-320D and includes less common more difficult conditions.

324A-324B-324C-324D. Clinical Geriatrics (1-2, 1-2, 1-2, 1-2) I-II-III-IV. Higby

Clinical experience—3-6 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program; satisfactory completion of course series 319, 320, and 321; and course 326 (may be taken concurrently). Application of principles of geriatric care; provision of a minimum of 160 hours of care to elderly in nursing homes, hospice and other clinical settings. (P/NP grading only.)

325. Health Promotion and Disease Prevention (4) II. Perry

Lecture—40 hours total. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program and satisfactory completion of course series 319, 320, 321. Course designed to increase student's knowledge of health promotion and disease prevention, to integrate it into their own lifestyle, and to implement the theories into their clinical practice.

326A-326B. Advanced Gerontology (2-1) I-II. Higby

Lecture—20 hours total (326A); lecture—10 hours total (326B). Prerequisite: satisfactory completion of course series 319, 320, 321. Process of aging and special health, medical, ethical and supportive needs of the elderly.

340A-340B-340C. Clinical Preceptorship for FNP/PAs (2-6) I, II, III. Treguboff and staff

Laboratory—8 to 24 hours. Prerequisite: registered student in FNP/PA Program. Student spends 8 to 24 hours per week with a physician preceptor in patient care to develop clinical skills necessary to assess and manage patients with common medical problems seen in primary care and long term care facilities.

341A-341B-341C. Advanced Clinical Preceptorship for FNP/PAs (3-8) I, II, III. Treguboff and staff

Laboratory—8 to 30 hours. Prerequisite: registered student in FNP/PA Program; successful completion of course 348A-348B-348C. Student spends 8 to 30 hours per week to build on clinical skills in primary care learned in course 348A-348B-348C, to assess and manage patients with complex and multiple problems, and to learn the management of patients in an inpatient setting.

343A-343B-343C. Inpatient Clinical Experience for FNP/PA Students (3-3-3) I, II, III, IV. Kelly

Clinical—50 hours. Prerequisite: registered student in Family Nurse Practitioner/Physicians Assistant Program; successful completion of course 340A-340B-340C; or consent of instructor. Student clerkship in the inpatient setting in Family Practice, Surgery, and medical/surgical subspecialty electives in UCDMC and/or affiliated institutions. Designed to expose the FNP/PA program student to inpatient management; acquaint student with FNP/PA role in inpatient setting. (P/NP grading only.)

350A-350B-350C. Ethics and Trends in Health Care for Physician Assistants (1-1-1) I, II. Treguboff and staff.

Lecture-discussion—1 hour. Prerequisite: registered student in the Physician Assistant Program. Trends and ethical issues in health care, and review the process and policies for ethical decision-making in patient care. These issues, trends and process will be related to the role of the physician assistant.

352A-352B-352C. Professional Development of the Physician Assistant (1-1-1) I-II-III. Treguboff and staff

Lecture-discussion—1 hour. Prerequisite: registered student in Physician Assistant Program. Study of role of the physician assistant and its historical evolution, of the organizational responsibilities of legal considerations of the physician assistant.

354A-354B-354C. Fundamentals of Primary Health Care for FNP/PA (3-3-3) I-II-III. Treguboff and staff

Lecture-discussion—3 hours. Prerequisite: registered student in Family Nurse Practitioner/Physician Assistant Program or consent of instructor. Study of anatomy and physiology, pathophysiology, diagnostic criteria, approaches to assess and manage common medical problems seen in primary health care.

***355A-355B-355C. Advanced Principles of Health Care for FNP/PA Students** (4-4-4) I-II-III. Treguboff and staff

Lecture-discussion—4 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program; successful completion of course 354A-354B-354C, or consent of instructor. Study of anatomy and physiology, pathophysiology, diagnostic criteria and approaches to assess and manage patients with complex and/or multiple health care problems in primary care settings, and to learn the management of patients in inpatient settings.

356A-356B-356C. Pharmacology for FNP/PA Students (1-1-1) I-II-III. Treguboff and staff

Lecture-discussion—1 hour. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program or consent of instructor. Principles of pharmacokinetics and pharmacodynamics, the classifications of drugs and representative drugs within each class, and application of these principles to pediatric and geriatric patients, and to pregnant or lactating women.

360A-360B-360C. Ethics and Trends in Health Care for FNP Students (1-1-1) I-II-III. Treguboff and staff

Lecture-discussion—1 hour. Prerequisite: registered student in the Family Nurse Practitioner Program or consent of instructor. The student will learn about trends and ethics in health care, and review process and policies for ethical decision-making in patient care. These issues, trends and processes will be related to the role of the Family Nurse Practitioner.

362A-362B-362C. Professional Development of the FNP (1-1-1) I-II-III. Treguboff and staff

Lecture-discussion—1 hour. Prerequisite: registered student in the Family Nurse Practitioner Program or consent of instructor. Study of the role of the nurse practitioner and its historical evolution, of the legal considerations, of the implications of case management and advocacy for the consumer, and of professional responsibilities of the Family Nurse Practitioner.

364A-364B-364C. Behavioral Science for FNP/PA Students (2-1-1) I-II-III. Treguboff and staff

Lecture-discussion—1 or 2 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program or consent of instructor. Study of communication skills and interviewing techniques, of self-awareness and

awareness of others, of assessment of patients' concerns and counseling skills to assist them gain insight and reach their own solutions, of behavior modification concepts and techniques.

364D-364E-364F. Behavioral Science for FNP/PA Students (1-1-1) I-II-III. Treguboff and staff
Lecture-discussion—4 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program; successful completion of course 364A-364B-364C or consent of instructor. Continuation of courses 364A-364B-364C.

366A-366B-366C. Family Practice and Community Health for FNP/PA Students (2-2-2) I-II-III. Treguboff and staff
Lecture-discussion—2 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program or consent of instructor. Study of family dynamics, growth and development, health care in all age groups including special concerns in pediatrics and geriatrics, health promotion and disease prevention, and cultural and community needs and concerns.

366D-366E-366F. Family Practice and Community Health for FNP/PA Students (1-1-1) I-II-III. Treguboff and staff
Lecture-discussion—2 hours. Prerequisite: registered student in the Family Nurse Practitioner/Physician Assistant Program; successful completion of course 366A-366B-366C or consent of instructor. Continuation of courses 366A-366B-366C.

***392I-392J. Advanced Clinical Preceptorship for Mid-level Practitioner (1-12) I, II, III, IV.** The Staff
Laboratory—3-36 hours. Prerequisite: enrollment in Family Nurse Practitioner/Physician Assistant program; course series 319, 320, 321. Enhance clinical skills of the FNP/PA in providing patient care in a variety of health care settings. (P/NP grading only.)

399. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. Davidson
Prerequisite: consent of instructor. Flexibility to develop and pursue research and clinical interests to enhance education in Family Practice. (P/NP grading only.)

Professional Courses

400A. Introduction to Patient Evaluation (1.5) I. Callahan
Lecture—6 hours, discussion—5 hours, and laboratory—9 hours (20 hours total). Prerequisite: 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 preceptors' offices, clinics or hospitals. Quarter I of Medical School curriculum. (Deferred grading only, pending completion of three-quarter sequence.)

400B. Introduction to Patient Evaluation (1) II. Arevalo
Lecture—1 hour and laboratory—19 hours (20 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Practice taking medical histories and performing physical examinations and writing the histories and physicals in an appropriate manner. Quarter II of Medical School curriculum. (Deferred grading only, pending completion of three-quarter course.)

400C. Introduction to Patient Evaluation (1.5) III. Arevalo
Lecture—1 hour, discussion—2 hours, and laboratory—22 hours (25 hours total). Prerequisite: 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. (Deferred grading only, pending completion of course 400C.)

401. Elective Preceptorship in Family Practice (2) I, II, III, IV. The Staff
Preceptorship—part-time (one 4-hour day per week; 10 weeks) or full-time (40-hour week per 1.5 units; 4 to 8 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 Community Clinic (2) I, II, III, IV. Tanji
Discussion—1 hour; laboratory—1/2 hour; practicum—1/2 hour. Prerequisite: second-year medical students with consent of instructor. Diagnose and treat simple illnesses at Davis Community Clinic under supervision of instructors. Learn alternate way of delivering primary care at low cost to patient and/or community.

432A-432B-432C-432D. Womankind Clinic (1/2-1/2-1/2-1/2) I-II-III-IV. Tanji
Clinic—1/2 hour. Prerequisite: first-year student in good standing. Students work at Womankind Clinic gaining exposure to episodic and comprehensive family planning and gynecological care in community clinic setting that emphasizes continuity of care. (S/U grading only.)

433A-433B-433C-433D. Womankind Clinic (1/2-1/2-1/2-1/2) I-II-III-IV. Tanji
Clinic—14 hours total. Prerequisite: second-year medical student in good academic standing. Students work at Womankind Clinic gaining exposure to episodic and comprehensive family planning and gynecological care in community clinic setting that emphasizes continuity of care. (S/U grading only.)

434A-434B-434C-434D-434E-434F-434G-434H. Primary Care at Clinica Tepati (3-3-3-3-3-3-3-3) I-II-III-IV-I-II-III-IV. Arevalo
Clinic—four 8-hour days; group seminar/discussion—ten 1-hour sessions; training session/lecture—four 2-hour sessions. Prerequisite: first- and second-year (full-time) medical students with consent of instructor; pre-application processed. Exposure to episodic and acute disease; learn physical examination and taking a complete history; also learn immunization techniques, use of laboratory tests. Limited enrollment. (S/U grading only.)

435A-435B-435C-435D-435E-435F-435G-435H. Primary Care at Clinica Tepati (3-3-3-3-3-3-3-3) I-II-III-IV-I-II-III-IV. Arevalo
Clinic—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.)

440. Ambulatory Medicine Clerkship (6 or 12) I, II, III, IV. The Staff
Clinical clerkship—full time (4 or 8 weeks). Prerequisite: third-year medicine clerkship. Ambulatory medicine experience in family practice setting. Acquisition of skills to evaluate and develop a treatment plan for patients with common medical problems seen by primary care physicians in the outpatient setting.

445. Sports Medicine from a Primary Care Perspective (6) I, II, III, IV. Tanji
Clinic—full time (4 weeks). Prerequisite: fourth-year medical student in good academic standing. Students spend full time in outpatient clinic settings in family practice, orthopaedic surgery, physical education, internal medicine, and a community private practice. Students learn principles and practice of sports medicine from a primary care perspective.

462. Family Practice Preceptorship (3-18) I, II, III, IV. The Staff
Clinic—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. The Staff
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. Arevalo
Clinic. 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 clinical activities of preceptor and analyze and report characteristics of the practice.

469. Family Practice Clerkship (3-18) I, II, III, IV. The Staff
Clinic—full-time. Prerequisite: third- and fourth-year medical students with consent of instructor (third-year students may elect to enroll for second half of spring quarter). Involvement in comprehensive primary medical care of patients in a family setting and observe the team approach to health care.

480. Insights in Family Practice (1-3) I, II, III, IV. The Staff
Clinic—3 to 9 hours; required readings. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Exposure to family practice in outpatient clinical setting. Three to nine hours per week spent with a community physician preceptor who is a member of the clinical faculty. (S/U grading only.)

498. Directed Group Study in Family Practice (1-9) I, II, III, IV. The Staff
Discussion—3-37 hours. Prerequisite: medical students with consent of instructor. Directed study on selected topics relating to family medicine and primary health care delivery; visits to and written analysis of selected innovative health care programs. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff
Prerequisite: medical students with consent of instructor. Research in various aspects of the health care delivery system. (S/U grading only.)

Human Anatomy

Upper Division Courses

101. The Gross and Microscopic Structure of the Human Body (4) II. 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. Patterson
Laboratory—two 3-hour sessions. Prerequisite: course 101 (may be taken concurrently). Laboratory will be taught from projections, models and slides to give students the opportunity to learn structure from direct experience.

192. Internship in Morphology (1-12) I, II, III, IV. The Staff
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. Patterson
Lecture—3 1/2 hours; discussion—1 hour; laboratory—10 1/2 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. Vijayan
Lecture—5 hours; laboratory—3 hours. Prerequisite: consent of instructor. Macroscopic anatomy of the nervous system to include its relationship to coverings, topography, and blood supply. Microscopic anatomy, pathways and internal organization of the nervous system.

205. Biology of Mammalian Gametes and Fertilization (2) III. Meisel
Lecture—1/2 hour; discussion—1 1/2 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 even-numbered years.

208. Comparative Biology of the Placenta (2) III. King
Lecture—1 1/2 hours; discussion—1/2 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. The Staff
Discussion—1 hour. Prerequisite: graduate student with research experience (may be taken concurrently); consent of instructor. Discussion of problems, progress and literature relevant to current research undertaken by laboratory groups in Human Anatomy. (S/U grading only.)

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, Meizel 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, Vijayan 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 involve, both morphology and microscopic anatomy, and examples of physiologic activity. (Same course as Human Physiology 403.)

497T. Tutoring in Human Anatomy (1-5) I, II, III, IV, The Staff
Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum for the School of Medicine. (S/U grading only.)

498. Advanced Group Study (1-12) I, II, III, IV, The Staff
Prerequisite: medical students, interns, and residents with consent of instructor. Directed reading and group discussion and/or laboratory experience on selected topics. (S/U grading only.)

499. Research (1-12) I, II, III, IV, The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (S/U grading only.)

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

200. Human Physiology (6) II, Gray and staff
Lecture—50 hours total; discussion—10 hours total. Prerequisite: graduate standing and consent of instructor. General cellular and organ system physiology, including neural, cardiovascular, respiratory, gastrointestinal and urinary systems in the human. Lectures concurrent with course 400; research-discussion and laboratory-demonstration sessions, and examinations separate.

210. Advanced General Physiology (3) III, Curry, Cala
Lecture—3 hours. Prerequisite: Biochemistry 101B, Chemistry 110B, Physiology 100B; graduate standing and consent of instructor. Physicochemical basis of living systems with emphasis on membrane permeability characteristics at both the cellular and tissue level. Offered in even-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.

250. Circulatory Transport and Fluid Exchange (3) I, Renkin, Kramer
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, Siefkin, Cross
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 400 or the equivalent; 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. 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, Gray, Curry 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, Carlson, Vijayan, Scobey, O'Rahilly
Lecture—40 hours; discussion—12 hours; laboratory—25 hours (77 hours total). Prerequisite: consent by Committee on Student Evaluation and Promotion. Neurobiology and neuroanatomy of the normal human nervous system considered in an integrated format. Laboratories involve morphology, 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 418.)

480. Pulmonary Function Evaluation (4) I, II, III, Siefkin, Cross
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 400 or the equivalent; consent of instructor. Clinical laboratory, physiological evaluations of pulmonary function. (Same course as 280.)

497T. Tutoring in Human Physiology (1-5) I, II, III, IV, Renkin
Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Directed Reading and Group Study (1-4) I, II, III, IV, Renkin and staff
Discussion—2-9 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**Upper Division Courses**

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.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV, The Staff (Chairperson in charge)
Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

Professional Courses

400. Introduction to Emergency Medicine (1.5) I, Derlet 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, J. Robbins
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, J. Robbins
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, Gerhardt, Rucker, Phinney, and staff
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 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, Lillington 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, Stone 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. Soeldner and 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.)

440. Ambulatory Medicine Clerkship (6 or 12) I, II, III, IV. Fitzgerald

Clinical experience—full time (4 or 8 weeks). Prerequisite: third-year medicine clerkship. Four- or eight-week ambulatory medicine experience in an internal medicine setting. Acquisition of skills to evaluate and develop a treatment plan for patients with common medical problems seen by primary care physicians in the outpatient setting.

461. Problems in Internal Medicine (6 or 9) I, II, III, IV. Wong
Clinical activity—full time (4 or 6 weeks). Prerequisite: satisfactory completion of third year of medical school; consent of instructor. Study of inpatients hospitalized on Medical Service. Experience in Internal Medicine at Woodland Clinic and Hospital. Daily rounds, mornings with instructor. Monday through Friday; afternoons patient assignments. Teaching conferences and combined radiology-pathology medicine seminars. Weekly allied specialty conference.

462. Externship in Medicine (1-21) I, II, III, IV. Fitzgerald and staff

Externship—full time (4, 8, or 12 weeks). Prerequisite: Medical Sciences 431; demonstrated ability to accept responsibility; consent of instructor. Student assumes role of acting intern and will be primary physician on medical ward under direction of medical resident and staff. Responsibility for patients admitted to acting intern and take call every fourth-night. Also taken at Children's S.F. Hospital. Limited enrollment.

463. Acting Internship in Medicine Intensive Care Unit (MICU) (9) I, II, III, IV. Albertson

Clinical activity—full time. Prerequisite: completion of third year in medical school; consent of Director of MICU. At UCD Medical Center, student functions as acting intern on MICU service under direction of medical resident and staff. Responsibility for patients admitted to MICU. On call in hospital every third night. Limited enrollment.

***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 conference 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.

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

Clinical clerkship (4 weeks)—9-12 hours (hospital); 1-5 hours (clinics). Prerequisite: third- and fourth-year medical students with advance approval by Division of Cardiology. Emphasis placed on history taking and physical examination of pediatric and adult patients with congenital and acquired cardiovascular disease. Hospital rounds in CCU and elsewhere. The roles of ECG, PCG, and cardiac fluoroscopy, etc., in office cardiology will be evaluated. May be repeated for credit. Limited enrollment.

460. Cardiology Clinical Clerkship: Consult Service (3-18) I, II, III, IV. The Staff

Inpatient-outpatient service (4 weeks)—full time (40 hours). Prerequisite: third- and fourth-year medical students with advance approval by Division of Cardiology. Participation with members of subspecialty consultation service in initial clinical evaluation, work-up, management, and follow-up 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 Division of Cardiology. Research in laboratory and exercise testing to be determined by instructor. Current methods of clinical research involving certain aspects of diagnosis and treatment. Includes acute coronary care, hemodynamic monitoring, stress testing, cardiac catheterization, pathologic correlations and the modern approach to therapy, both medical and surgical, based on pathophysiologic mechanisms. May be repeated for credit. Limited enrollment.

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 conference. Limited enrollment.

480. Insights in Cardiology (1-3) I, II, III, IV. The Staff
Clinical experience—3-9 hours. Prerequisite: medical student in good academic standing and approval by Division of Cardiology. Students attend one or more cardiovascular medicine clinics: general, hypertension, arrhythmia. Introduction to the diagnosis/treatment of common cardiovascular problems. (S/U grading only.)

498. Special Group Study: EKG Unit (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Special study—2-week sessions. Prerequisite: medical students with advance approval by monthly attending faculty. Special group study in cardiology for medical students in EKG unit. May include lectures, directed reading, and/or discussion groups. May be repeated for credit. (S/U grading only.) Limited enrollment.

499. Research (1-12) I, II, III, IV. The Staff
Prerequisite: approval by Division of Cardiology. (S/U grading only.)

Internal Medicine—Emergency Medicine

Professional Courses

460. Emergency Medicine Clerkship (3-12) I, II, III, IV. Derlet and staff

Lecture—2 hours; discussion—2 hours; clinical experience—full time (2 to 12 weeks). Prerequisite: third- or fourth-year medical student, satisfactory completion of Internal Medicine and Surgery clerkship, and consent of instructor. Clinical work at UCD Medical Center or other area hospitals' emergency departments will be supplemented by didactic sessions. Students will be assigned appropriate emergency patients and will examine diseases and treat those patients.

465. Acting Internship in Emergency Medicine (6-12) I, II, III, IV. Derlet

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. Derlet
Laboratory—40 hours; research—full time (4 to 12 weeks). Prerequisite: consent of instructor. Elective where topics may be selected in either basic or clinical research areas of Emergency and/or Critical Care Medicine. The goals will be tailored to each individual student. Enrollment requires prior discussion and consent of instructor.

Internal Medicine—Endocrinology

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—25-25 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.

480. Insights in Endocrinology (1-3) I, II, III, IV. Walter
Clinical experience—3-9 hours; oral presentation. Prerequisite: student in good academic standing and consent of instructor. First- or second-year students observe in morning Endocrine and Diabetes clinics and attend bi-weekly noon and afternoon endocrine conferences. They also give brief endocrine physiology oral presentation to the endocrine group. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Walter in charge)
Prerequisite: consent of instructor.

Internal Medicine—Gastroenterology

Professional Courses

460. Clinical Clerkship (3-18) I, II, III, IV. Pimston and staff
Clinical rotation—full time (2 to 12 weeks). Prerequisite: completion of third-year of medical school. Work-up, manage, and follow-up new patients on active inpatient consulting service. Gastroenterology/Hepatology patients. Daily rounds with attending physician.

462. Gastroenterology Clinical Clerkship (1-18) I, II, III, IV. Inpatient-outpatient clinical activity. 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. Offered at VM Hospital, Martinez.

480. Insights in Gastroenterology (1-3) I, II, III, IV. Trudeau
Clinical experience—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. To gain insight in clinical activities of Gastroenterology Division through attendance at any of the following: endoscopic procedures, ward rounds, outpatient clinic, and G.I. grand rounds. (S/U grading only.)

499. Research (1-12) I, II, III, IV. Pimstone, Trudeau, Danilewitz, Lawson, Prindville
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. Clinical: varied. (S/U grading only.)

Internal Medicine—General Medicine

Professional Courses

440A-440B-440C-440D-440E-440F-440G. Introduction to AIDS and Related Disorders (2) I, II, III, IV. Flynn
Discussion—1 hour; clinical experience—3 hours. Prerequisite: first and second year medical students in good academic standing and permission of instructor. This course familiarizes students with the diagnosis and treatment of individuals infected with the human immunodeficiency virus. Students will interview patients, observe patient care and participate in ongoing clinic research as well as examine alternative life styles.

450. Physicians in the Nuclear Age (1) I. Flynn
Lecture—1 hour; discussion—1/2 hour. Prerequisite: medical student in good standing, or consent of instructor. Examine actual and potential physical, medical, psychosocial, epidemiological, and economic consequences of nuclear weapons and nuclear war. (S/U grading only.) Offered in even-numbered years.

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.

471A-471B-471C-471D-471E-471F-471G. Clinic of AIDS and Related Disorders (2) I, II, III, IV. Flynn

Discussion—1 hour; clinical experience—3 hours. Prerequisite: third and fourth year medical students in good academic standing and permission of instructor. Students will participate in patient care, including patient examination and the diagnosis and treatment of patients with acquired immune deficiency syndrome and AIDS related complex. Students will participate in intensive ambulatory care medicine as well as clinic research.

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.

461. Ambulatory and Consult Clerkship (6 or 12) I, II, III, IV. Lewis and staff
Clinical experience—full time (4 to 8 weeks). Prerequisite: fourth-year medical student in good academic standing. Outpatient rotations include general hematology/oncology clinics, hemophilia clinic, sickle cell clinic, and two medical/surgical joint clinics. In addition, students will work on inpatient hematology and oncology consult service, the bone marrow service, and will attend all conferences sponsored by the Division.

462. Hematology-Oncology Clinical Clerkship (6-16) I, II, III, IV. Gandra 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 III (6) I, II, III, IV. Meyers
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. Emphasis on outpatient care and home care. This elective provides experience in symptom 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.)

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 UC Davis 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 years of 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. Clinical Clerkship (3-18) I, II, III, IV. McCabe
Lecture—1 hour, discussion—10 hours, laboratory—variable; clinical clerkship—full time (2 to 12 weeks). Prerequisite: core medicine clerkship. Students will do clinical consultations in Infectious Diseases under supervision of a fellow in infectious diseases and attending physician. Students will participate actively in conferences and attending rounds with optional participation in the diagnostic laboratory.

480. Insights in Infectious Diseases (1-3) I, II, III, IV. Goldstein
Clinical experience—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. Student will attend infectious diseases consult rounds and also have opportunity to observe outpatient infectious disease practice and clinically related research. Introduction to diagnosis and treatment of patients in Infectious Diseases. (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 inpatient/outpatient clinical activities, attendance at specific lectures and conferences at UCD Medical Center covering the field of nephrology and fluid-electrolyte disorders. Limited enrollment.

461. Nephrology, Fluid and Electrolytes (4.5-18) I, II, III, IV. Kaysen
Lecture—6 hours; discussion—10 hours; clinical activity—full time (3 to 12 weeks). Prerequisite: fourth-year medical student with consent of instructor. Active participation in all clinical activities and conferences at the Martinez VA Hospital and attendance at specific lectures covering the field of nephrology and fluid balance. Limited enrollment.

499. Research in Nephrology (3-18) I, II, III, IV. Gulyassy
Prerequisite: individual arrangement and consent of instructor. Individual arrangement with 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. Halsted, Garhardt, Phinney, Reisenauer, Davis
Seminar—1 hour. Weekly seminar presented by a graduate student, taking the form of research completed or in progress, topic review or journal review from current journal. (S/U grading only.)

Professional Courses

461. Nutrition Clinical Clerkship (3-18) I, II, III, IV. Halsted and staff
Lecture—2 hours; clinical experience—full time (2 to 12 weeks). In-depth experience in assessment and monitoring of nutritional support of adult patients at UCD Medical Center whose illnesses are complicated by malnutrition, and of patients attending the Nutrition Clinic with problems in under-nutrition due to various illnesses.

480. Insights in Clinical Nutrition (1-3) I, II, III, IV. Halsted
Clinical experience—3-9 hours. Prerequisite: student in good standing; consent of instructor. Student will attend weekly clinical nutrition consult rounds (four evenings) and/or Nutrition Clinic (one day). Introduction to diagnosis and treatment of common nutritional problems. (S/U grading only.)

499. Research in Nutrition (9-18) I, II, III, IV. Halsted, Gerhardt, Phinney, Reisenauer, Davis
Prerequisite: medical student in good standing; consent of instructor. Participation in on-going clinical or basic nutrition research. Student may devise own project depending upon time commitments.

Internal Medicine—Occupational and Environmental Health**Upper Division Course**

190C. Research Conference in Occupational and Environmental Health (1) I. Beaumont; II. Samuels; III. McCurdy
Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference on research problems, progress and techniques in occupational and environmental health. Critical discussion of recent journal articles. May be repeated for credit. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

250. Pesticide Epidemiology (3) I, Goldsmith
Discussion—1 hour; seminar—2 hours. Prerequisite: medical students; graduate students in biological or environmental health sciences who have completed or are enrolled in Epidemiology and Preventive Medicine 405; upper division undergraduate who has completed Environmental Studies 126; consent of instructor. Examination of the human health effects and the risk of disease from occupational and community exposure to pesticides. Some of the clinical endpoints include cancer, neurotoxic effects, reproductive impairment, and dermatologic conditions.

251. Toxic Substances and Environmental Medicine (3) II. Goldsmith
Discussion—1 hour; seminar—2 hours. Prerequisite: medical students; graduate students in biological or environmental health sciences who have completed or are enrolled in Epidemiology and Preventive Medicine 405; upper division undergraduate who has completed Environmental Studies 126; consent of instructor. Examination of the human health effects and the risk of disease from community (and occupational) exposure to toxic waste.

Professional Course

466. Occupational and Environmental Medicine Elective (6-12) I, II, III, IV. Schenker
Clinical and laboratory experience—full time (4 to 8 weeks). Prerequisite: fourth-year student and consent of instructor. Participate in activities of Occupational and Environmental Health Unit. Major activity is involvement in an epidemiologic research project of the University. Also participate in Ambulatory Clinic at UCD Medical Center.

480. Insights in Occupational and Environmental Medicine (1-3) I, II, III, IV. Schenker
Clinical experience—3-9 hours; small research projects. Prerequisite: first- or second-year medical student in good standing; consent of instructor. Students will observe and participate in research and clinical activities in occupational and environmental medicine which include conferences, occupational and environmental medicine clinical activities and field visits. Students develop and present small individual research projects. (S/U grading only.)

499. Research (1-12) I, II, III, IV. Schenker and staff
Laboratory—40 hours; clinic—4 or 8 hours. Prerequisite:

third- or fourth-year medical student or consent of instructor. Student participates in activities of Division of Occupational and Environmental Health. Major activity is involvement in an epidemiologic research project of the Division. Also participates in ambulatory Occupational and Environmental Medicine Clinic at UCD Medical Center.

Internal Medicine—Pulmonary Medicine

Graduate Course

210. Grant and Scientific Paper Writing (1) I, II, III, IV. Last Discussion—2 hours. Basics of scientific writing for grants and papers. Each student will prepare a grant or paper for critique and tutorial feedback.

Professional Courses

460. Pulmonary Clinical Clerkship (3-18) I, II, III, IV. Lillington and staff
Clinical experience—full time (2 to 12 weeks). Prerequisite: Medical Sciences 431. At UCD Medical Center participating and rounding with Pulmonary fellows and consultation staff. Also includes pulmonary function test interpretation, outpatient assignments in outpatient clinic and preparation and presentation of material at weekly conferences.

462. Pulmonary Clinical Clerkship (3-18) I, II, III, IV. Krumpke 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.

463. Practical Critical Care Medicine (3-6) II. Foulke
Lecture—10 hours; discussion—10 hours; ICU rounds (2 to 4 weeks). Prerequisite: satisfactory completion of third-year study and consent of instructor. Practical review of basic equipment, technology, emergent situations, and invasive procedures encountered in the Intensive Care Unit utilizing articles from current medical literature.

***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.

480. Pulmonary-Critical Care Medicine Insights (1-3) I, II, III, IV. Lillington
Clinical experience—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. Student will attend respiratory outpatient clinics and in-patient pulmonary consultation rounds and medical intensive care rounds. Introduction to diagnosis and treatment of common pulmonary problems. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Cross in charge)
Prerequisite: consent of instructor. (S/U grading only.)

Internal Medicine—Rheumatology-Allergy

Lower Division Course

99. Directed Research in Immunology (1-5) I, II, III, IV. Gershwin
Laboratory—1-4 hours. Prerequisite: consent of instructor. Independent research will be encouraged in basic immunology, including the role of the cellular immune system in oncogenesis. (P/NP grading only.)

Upper Division 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.

480. Insights in Rheumatology (1-3) I, II, III, IV. Leek
Clinical activity—3-9 hours. Prerequisite: student in good academic standing and consent of instructor. Participation in rheumatology consultation rounds, rheumatic disease clinics and conferences with supervised readings in rheumatology. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Gershwin in charge)
Prerequisite: medical student with consent of instructor. Part-time participation in active clinical and basic research projects which can involve both patient care and relevant laboratory procedures. Students can gain experience in clinical medicine and clinical investigation. (S/U grading only.)

Medical Microbiology

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 and genetic 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.

116. Parasitology for Wildlife Biologists (2) III. Theis
Lecture—2 hours. Prerequisite: upper division standing in wildlife biology or biological sciences or ecology. Emphasis on the role diseases and parasites play in wildlife dynamics. Lectures on techniques of collection, preservation and methods of surveying wildlife for parasites and the pathogenesis, ecology and zoonotic potential of parasites encountered by wildlife biologists.

130. Medical Mycology (2) II. Pappagianis
Lecture—2 hours. Prerequisite: 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 (Beaman 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 (Beaman in charge)
Hours to be arranged. Prerequisite: upper division standing and consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (P/NP grading only.)

199. Research in Medical Microbiology (1-5) I, II, III, IV. The Staff (Beaman in charge)

Hours to be arranged. Prerequisite: upper division standing and consent of instructor. Individual research. (P/NP grading only.)

Graduate Courses

209. Frontiers in Immunology (2) I, II, III. Benjamini, Scibienski
Discussion—2 hours. Prerequisite: consent of instructor. Current developments in various aspects of immunology and their interrelationships. (S/U grading only.) (Same course as 409.)

215. Medical Parasitology (5) I, Theis
Lecture—3 hours; laboratory—6 hours. Prerequisite: graduate students with consent of instructor. Epidemiological, pathogenesis, diagnostic methods and laboratory studies of protozoa, helminths and arthropods of medical importance. Offered in even-numbered years. (Same course as 415.)

220. Current Concepts in Bacterial Ultrastructure (2) III. Beaman
Discussion—2 hours; student presentations; term paper. Prerequisite: Microbiology 105 or consent of instructor. Critical evaluation of current literature dealing with all aspects of bacterial ultrastructure. Discussion of selected and assigned reading and formal student presentations of assigned topics.

298. Group Study in Medical Microbiology and Immunology (1-5) I, II, III, IV. The Staff (Beaman in charge)
Prerequisite: consent of instructor; open to graduate students. Directed reading and discussion and/or laboratory investigation on selected topics. (Sections 1, 2, 4, 5: S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Beaman in charge)
Prerequisite: consent of instructor; open to graduate students. Laboratory investigation contributing to the dissertation for a graduate degree. (S/U grading only.)

Professional Courses

405. Immunologic Prophylaxis (2) II. Pappagianis
Lecture—2 hours. Prerequisite: consent of instructor.† Basics 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 and genetic basis of antibody diversity; cellular basis of immunity; immunochemical and cellular aspects of hypersensitivity; immunogenetics and regulation of the immune response. (S/U grading only.) (Same course as 107.)

409. 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, pathogenesis, diagnostic methods and laboratory studies of protozoa, helminths and arthropods of medical importance. Offered in even-numbered years. (Same course as 215.)

420. Current Concepts in Bacterial Ultrastructure (2) III. Beaman
Discussion—2 hours; formal presentation or term paper. Prerequisite: medical students with consent of instructor. Evaluation of current status of bacterial ultrastructure with an emphasis on host-parasite interactions through discussions and assigned readings. (S/U grading only.)

430. Medical Mycology (2) 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. Scibienski and staff
Lecture—27 hours and laboratory—4 hours (31 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, Beaman and staff
Lecture—64 hours total; laboratory—28 hours total. Pre-

requisite: 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.

497T. Tutoring in Medical Microbiology (1-5) I, II, III, IV. Beaman and staff

Tutoring—3-15 hours. Prerequisite: appropriate preparation in subject matter and consent of instructor. Assist instructor by tutoring medical students in one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Group Study in Medical Microbiology and Immunology (1-5) I, II, III, IV. The Staff (Beaman in charge)
Prerequisite: medical students with consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (Beaman in charge)
Prerequisite: medical students with consent of instructor. (S/U grading only.)

Neurology

Lower Division Course

199. Individual Special Study and Research (1-4) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. Individual special study in neurophysiology and biomedical engineering is offered to qualified students. Studies on psychophysics, single-unit electrophysiology and instrumentation are offered in Davis. (P/NP grading only.)

Graduate Courses

290. Seminar in Selected Topics (1) I, II, III, IV. Scobey, Gorin
Seminar—1 hour. Prerequisite: consent of instructor. Selected topics in Neuroscience will be offered. (S/U grading only.)

298. Group Study (1-5) I, II, III, IV. The Staff (Gabor in charge)
Prerequisite: consent of instructor. For graduate students desiring to explore particular topics in depth. Lectures and conferences may be involved. (S/U grading only.)

299. Individual Special Study and Research (1-12) I, II, III, IV. 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. Davis
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, 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 experience 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. Gabor, Seyal, Davis
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.

480. Insights in Neurology (1-3) I, II, III, IV. The Staff
Discussion—3 hours; clinical experience—3 to 9 hours. Prerequisite: student in good academic standing; consent of instructor. Attendance at neurology grand rounds and regular rounds following. (S/U grading only.)

499. Research (1-12) I, II, III, IV. The Staff (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. Special Study in Neurosurgery for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: advanced undergraduate standing with consent of instructor. Students may participate in ongoing neurosurgical projects or may pursue and design independent projects. (P/NP grading only.)

Graduate Course

299. Neurosurgery Research (3-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: graduate student with consent of instructor. Student may participate in ongoing neurosurgical projects

or may pursue and design independent projects. (S/U grading only.)

Professional Courses

451. Neurosurgical Critical Care Clerkship (3) I, II, III. The Staff (Chairperson in charge)
Clinical activity—full time (2 weeks). Prerequisite: third- or fourth-year medical student having completed a neurosurgical clerkship or consent of instructor. Students participate in the care of neurosurgical patients in the NSICU and in the admission and surgical management of patients admitted through the Emergency Room.

460. Clinical Neurosurgery (6-18) I, II, III, IV. The Staff (Chairperson in charge)
Clinical activity—full time (3 days per unit; 4 weeks minimum). Prerequisite: third- and fourth-year medical students; consent of instructor.† Admission and follow-up of patients. Neurological history, examination and further diagnostic procedures emphasized. Students participate in meaningful aspects of surgical procedures and attend listed conferences, rounds, and seminars.

464. Externship (6-18) I, II, III, IV. The Staff (Chairperson in charge)
Clinical activity—full time (4-12 weeks). Prerequisite: fourth-year medical student having completed a neurosurgical clerkship or consent of instructor. Clerkship in neurosurgery to be arranged at another institution with accredited residency program in neurosurgery under proper supervision.

465. Clinical Neurosurgery Martinez VA Medical Center (6 or 18) I, II, III, IV. Andrews and staff
Clinical activity—full time (4 to 12 weeks). Prerequisite: third- or fourth-year medical students or consent of instructor. Patient work-up, peri-operative care, and frequent first or second assisting in the operating room. Close integration with active Neurology Service insures in-depth exposure to the neurological history examination and diagnostic procedures for patients with nervous system disorders.

470. Advanced Clinical Neurosurgery (6-18) I, II, III, IV. The Staff (Chairperson in charge)
Clinical activity—full time (4-12 weeks). Prerequisite: fourth-year medical student in good academic standing. Student will function as acting intern on neurosurgery service. Admission and management of patients. Neurological history, examination, diagnostic procedures, and surgical management are emphasized. Students participate in meaningful aspects of surgical procedures and attend required conferences and rounds.

***480. Insights in Neurosurgery** (1-3) I, II, III, IV. The Staff
Clinical experience—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Observation of neurosurgical care in emergency room, operating room and hospital floors, including manner of treatment of a variety of chronic and acute neurological diseases. (S/U grading only.)

499. Neurosurgery Research (6-18) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: medical student with consent of instructor. Student may participate in ongoing neurosurgical projects or may pursue and design independent projects. (S/U grading only.)

Obstetrics and Gynecology

Lower Division Courses

190. Seminar in Early Mammalian Development (1) I, II, III. Wiley
Seminar—1 hour; short paper. Prerequisite: Zoology 100 or the equivalent. Each student will present paper from the recent scientific literature on various research topics in early mammalian development. Short paper at the end of course.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

290. Current Topics in Research (1) I, II, III, IV. The Staff
Seminar—1 hour. Prerequisite: graduate standing and consent of instructor. Selected topics in reproductive biology. (S/U grading only.)

291. Seminar in Early Mammalian Development (1) I, II, III, IV. Wiley
Seminar—1 hour. Each student will be asked to present a paper from the recent scientific literature on various research topics in early mammalian development. Short paper will be required at the end of course.

298. Group Study (1-5) I, II, III, IV. Overstreet
Prerequisite: graduate standing; consent of instructor.

299. Research (1-12) I, II, III, IV. Overstreet
Prerequisite: graduate standing; consent of instructor. (S/U grading only.)

Professional Courses

***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. The Staff (Obstetrics and Gynecology, Pediatrics)

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. Schneider 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. Schneider.

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. Schneider.

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. The Staff

Clinical activity—full time (3 days per unit). Prerequisite: third- and fourth-year medical student; Medical Sciences 432A (or the equivalent); consent of instructor. Active participation in inpatient and outpatient care. Attendance at specified conferences; student-faculty member informal conferences. May be repeated for credit.

***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.

***469. Perinatal Medicine Clerkship** (4-18) I, II, III, IV. Hanson and staff (of Maternal/Fetal Medicine Division)

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 counseling.

470. Acting Internship in Obstetrics and Gynecology (6-8) I, II, III, IV. O

Clinical activity—full time (4-6 weeks). Prerequisite: third- and fourth-year medical students who have completed Medical Sciences 432A; consent of instructor. Student will perform as intern and expect the following experience: Obstetrics and Gynecology, 2 weeks each; perform inpatient care; be on call every third night; attend scheduled conferences one half-day per week. Round daily with attending.

471. Ambulatory Obstetrics and Synecology (6-8) I, II, III, IV. MacKay

Clinical activity—full time (4-6 weeks). Prerequisite: third- and fourth-year medical students who have completed Medical Sciences 432A; consent of instructor. Student to participate in following clinics each week: General Gynecology, New and Return Obstetrics, Post-Partum, High-Risk Obstetrics, Pre-Operation Clinic, other specialty clinics as assigned. Student will conduct examinations, present patients to staff and will be able to discuss treatment regimens. Night call in Labor and Delivery Suite every third night.

499. Research in Obstetrics and Gynecology (4-18) I, II, III, IV. Chang 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

Upper Division Course

192. Research Internship (1-12) I, II, III, IV. The Staff
Worklearn experience—3-36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-study experience in ophthalmology research. Research staff in Ophthalmology have programs in cell biology, electron microscopy, biochemistry, immunology and visual psychophysics. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Course

299. Basic Research in Visual Science (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses

440. Ophthalmology Required Clerkship (3) I, II, III, IV. 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 UCSD 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 UCSD Medical Center may be arranged in 8-week units of one service alone, or in combination, as arranged with instructors.

480. Insights in Ophthalmology (1-3) I, II, III, IV. Lewis

Clinical experience—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Clinical exposure in ophthalmology including slide-tape program, patient exposure, and department conferences (i.e., grand rounds and subspecialty conference). (S/U grading only.)

498. Group Study (1-3) I, II, III, IV. The Staff (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. The Staff

To be arranged—3-36 hours. Prerequisite: medical students with consent of instructor. Individual research on selected topics in optics and visual physiology, cornea and external disease, or glaucoma. (S/U grading only.)

Orthopaedic Surgery

Lower Division Course

***99. Special Studies for Undergraduates** (1-4) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: lower division standing. (P/NP grading only.)

Upper Division Course

***199. Special Studies for Advanced Undergraduates** (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: upper division standing; consent of instructor. (P/NP grading only.)

Professional Courses

401A. Sports Medicine: Medical Aspects of Sports Injuries (3) I, Marder

Lecture—2 hours; laboratory—1 hour. Prerequisite: completion of first year of medical school. Multidisciplinary course introducing student to the 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. (S/U grading only.) (Same course as Physical Medicine and Rehabilitation 401A.)

***421. Skeletal System** (2.5)

Lecture—20 hours total; discussion—12 hours total. Pre-

requisite: 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 (3-6) I, II, III, IV. Szabo

Clinic—full time (2 to 4 weeks). Prerequisite: third- or fourth-year student in good academic standing; completion of human anatomy and consent of instructor. Elective providing opportunity to observe and assist in emergency and operating rooms in management of orthopaedic problems of trauma under supervision of resident on call. Does not meet surgical specialty requirement. Limited enrollment.

428. Ambulatory Orthopaedics (3-6) I, II, III, IV. Szabo

Clinic—full time (2 to 4 weeks). Prerequisite: third- or fourth-year student in good academic standing; and consent of instructor. Introduction to general orthopaedic problems and their management in an outpatient environment. Students will conduct orthopaedic examinations, present patients to staff, and lead discussion of treatment regimens. Emphasis placed on orthopaedic physical exam and interpretation of X-rays. Does not meet surgical specialty requirement. Limited enrollment.

440. Clinical and Surgical Orthopaedics (6) I, II, III, IV. Szabo

Clinical experience—full time (4 weeks). Prerequisite: third- or fourth-year student in good academic standing; and consent of instructor. Rotation on an assigned orthopaedic service, emphasizing didactic teaching, related to the musculoskeletal system. Outpatient/inpatient rounds, emergency room and operating room exposure. Meets surgical specialty requirement.

462. Community Preceptorship (6) I, II, III, IV. Szabo

Clinical experience—full time (4 weeks). Prerequisite: third- or fourth-year student in good academic standing and consent of instructor. Designed to acquaint student with private practice of orthopaedics in the community setting. Opportunity to observe and assist private practitioners in office, emergency room and inpatient environment. Preceptorships available in Sacramento and surrounding areas. Student must provide own transportation.

464. Acting Internship (6) I, II, III, IV. Szabo

Clinical experience—full time (4 weeks). Prerequisite: third- or fourth-year student in good academic standing; and consent of instructor. Rotation designed to increase basic knowledge of musculoskeletal abnormalities at clinical level. Attention focused on selective case material. For those students who demonstrate proficiency, responsibility will be similar to that of intern. Does not meet surgical specialty requirement.

480. Insights in Orthopaedic Surgery (1-3) I, II, III, IV. Szabo

Clinical experience—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Exposure to aims, methods and procedures in orthopaedic surgery via attendance at grand rounds, patient care conferences, and group discussions. (S/U grading only.)

499. Orthopaedics Research (1-12) I, II, III, IV. The Staff (Szabo in charge)

Clinic—3 hours to full time (to be arranged with individual faculty). Prerequisite: third- or fourth-year student in good academic standing; consent of instructor. Laboratory or clinical investigation on selected topics. (Does not meet surgical specialty requirement.) (S/U grading only.)

Otolaryngology

Lower Division Courses

***192. Internship in Otolaryngology** (1-12) I, II, III, IV. Chairperson in charge

Project study—2 to 36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-learn experience in otolaryngology and related fields. Final project report. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study in Otolaryngology for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced undergraduate with consent of instructor. (P/NP grading only.)

Graduate Course

298. Group Study (1-5) I, II, III, IV. The Staff (S/U grading.)

299. Individual Study in Otolaryngology for Advanced Graduate Students (1-12) I, II, III, IV. Chole and staff

Prerequisite: advanced graduate student with consent of instructor. (S/U grading only.)

Professional Courses

***400. Suture Techniques** (1) I, II, III, IV. The Staff
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 Otolaryngology (1) I, II, III, IV. Chole
Lecture—1 hour; laboratory—1 hour; practical—1 hour total. Prerequisite: second-year medical students with consent of instructor; open to graduate students.† Obtaining the history, applied anatomy of the regions, and the art of the examination. Head mirror required.

402. Otolaryngology in Family Practice (1) I, II, III, IV.
Lecture—10 hours total. Prerequisite: fourth-year medical students and family practitioners with 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. Otolaryngology Required Clerkship (3) I, II, III, IV.
Clinical clerkship—full time (2 weeks). Prerequisite: consent by Committee on Student Evaluation and Promotion. Provides fundamental knowledge of otolaryngologic diagnosis and principles, develops facility with basic Ear, Nose and Throat instruments, provides an understanding of treatment for ear, nose and throat problems manageable by a primary care physician, provides knowledge of what patients should be referred for otolaryngologic care.

460. Clinical Otolaryngology Elective (3-18) I, II, III, IV.
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.
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.)

480. Insights in Otolaryngology (1-3) I, II, III, IV. Senders
Clinical experience—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Individualized activities (depending upon time available and previous exposure to Ear, Nose and Throat) including observing patient exams, ward rounds and attendance at lectures and grand rounds.

***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 otolaryngologic and related literature and recent advances.

498. Individual or Group Study (1-5) I, II, III. The Staff
Lecture-discussion—1-2 hours; laboratory—1-4 hours. Prerequisite: consent of instructor. Introduction to basic research in Otolaryngology. Lectures, discussion and laboratory study of sensory and motor systems. (S/U grading only.)

499. Research (1-12) I, II, III, IV. Donald, Chole, Senders
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 experience—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. (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. Dis-

ussion 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.

210. Introduction to Human Pathology (5) III, C. Miller
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.

299. Research (1-12) I, II, III, IV. The Staff
Prerequisite: consent of instructor. (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.

411. General Pathology (3) III. Ruebner
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. Laboratory Medicine (2) III. Kost
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.)

464. Clerkship in Advanced Applied Surgical Pathology (6-9) I, II, III, IV. Tesluk
Clinical Clerkship—full time (4-6 weeks). Prerequisite: third- or fourth-year medical student 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.

465. Applied Clinical Laboratory Immunology (9) II, III. Miller
Clinical Clerkship—full time (6 weeks). Prerequisite: third-

or fourth-year medical students with consent of instructor. Emphasis upon laboratory techniques, procedures and interpretation of laboratory results. Students will be expected to participate fully and in all laboratory operations including bench techniques, laboratory management and quality control. (S/U grading only.)

***466. Medical Jurisprudence** (2) II. 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.)

497T. Tutoring in Pathology (1-5) I, II, III, IV. The Staff
Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Advanced Group Study (1-5) I, II, III, IV. The Staff
Prerequisite: medical student and consent of instructor. Group study in variety of advanced topics in general, special, experimental, or comparative pathology. (S/U grading only 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 (Chairperson in charge)
Prerequisite: undergraduate student with consent of instructor based upon adequate preparation as determined by instructor. (P/NP grading only.)

Graduate Course

299. Pediatric Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)
Prerequisite: graduate students who are candidates for a degree in some area of biology or behavioral sciences; consent of instructor. (S/U grading only.)

Professional Courses

401. Preceptorship in Pediatrics (2) I, II, III, IV. Chairperson in charge
Preceptorship—half time. Prerequisite: second-year medical student or first-year medical student with consent of instructor. Opportunity to observe and participate in primary medical care in a practicing pediatrician's office. Participation in history-taking and physical examination will be at discretion of preceptor and dependent on student's experience. Evaluation by student.

402. Clinical Experience in Private Practice (1-18) I, II, III, IV. Chairperson in charge
Clinical activity—full time (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 and staff (Pediatrics; Nematology)
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. Acting Internship: General Inpatient Pediatric Clerkship (6-18) I, II, III, IV. Halsted
Clinical experience—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. The Ward Acting Intern functions in a manner similar to that of a pediatric intern. The Acting Intern takes admissions in the regular sequence and is expected to take night call. The Acting Intern can expect to manage between six and ten patients at a time. Limited enrollment.

460B. Acting Internship: Outpatient Pediatrics (6-18) I, II, III, IV. Beauchamp
Clinical experience—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. Supervised experience in pediatric care on outpatient service at UCD Medical Center. Student functions as "Acting Intern" with appropriate supervision by residents and attending faculty, and expected to take night call. Limited enrollment.

461. Elective in Pediatric Hematology/Oncology (3-18) III. Abildgaard

Clinical experience—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of hematologic disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

462. Elective in Pediatric Endocrinology (3-18) I, II, III, IV. Connors

Clinical experience—full time (2 to 12 weeks). Prerequisite: completion of second-year study or the equivalent; consent of instructor. Inpatient and outpatient experience in diagnosis and management of endocrine disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment. (S/U grading only.)

464. Acting Internship in Neonatology (6-18) I, II, III, IV. Ahlfors
Clinical experience—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of B or better; letter of recommendation from Pediatrics faculty member. Diagnostic and therapeutic aspect of the medical and surgical high-risk neonate. Student expected to take night call. Limited enrollment.

465. Pediatric Specialty Clinic Elective (3-18) I, II, III, IV. Beauchamp

Clinical experience—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Supervised experience in a variety of pediatric subspecialty clinics. Limited enrollment.

466. Elective in Pediatric Cardiology (3-18) I, II, III, IV. Choy
Clinical experience—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B. Inpatient and outpatient experience in diagnosis and management of cardiologic disorders in children. Laboratory experience and participation in clinical investigation may be arranged.

467. Elective in Pulmonary Medicine (3-18) I, II, III, IV. McDonald

Clinical experience—full time (2 to 12 weeks); daily rounds, two weekly half-day clinics. Prerequisite: pediatric clerkship. Inpatient and outpatient management of pediatric patients with pulmonary diseases. These will include but will not be limited to cystic fibrosis, asthma, and other forms of chronic pulmonary diseases as well as congenital abnormalities.

468. Elective in Pediatric Nephrology (3-18) I, II, III, IV. Adelman

Clinical experience—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of renal disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

469. Elective in Pediatric Infectious Disease (3-18) I, II, III, IV. Halsted

Clinical experience—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and treatment of infectious disease of infants and children. Laboratory and clinical investigation may be arranged. Limited enrollment.

470. Elective in Pediatric Neurology (3-18) I, II, III, IV. Davis

Clinical experience—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of neurological disorders in children. Course 470 does not satisfy fourth-year neurology requirement. Limited enrollment.

471. Elective in Pediatric Gastroenterology (3-18) I, II, III, IV. Cannon

Clinical experience—full time (2 to 12 weeks). Prerequisite: satisfactory completion of Medical Sciences 432B; consent of instructor. Inpatient and outpatient experience in diagnosis and management of gastroenterology disorders in children. Laboratory experience and participation in clinical investigation may be arranged. Limited enrollment.

476. Acting Internship in Pediatric Intensive Care (6-18) I, II, III, IV. Sheikh

Clinical experience—full time (4 to 12 weeks). Prerequisite: completion of Medical Sciences 432B with grade of A or consent of instructor of record; letter of recommendation from Pediatrics faculty member. Evaluation and support of critically ill infants and children. In general, student expected to take night call every third night during rotation. Limited enrollment.

***480. Insights in Pediatrics (1-3) I, II, III, IV.**

Clinical experience—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Introduction to clinical pediatrics, utilizing rounds, clinics and conferences, including manner of diagnosis and treatment of pediatric patients. (S/U grading only.)

***499. Research Topics in Pediatrics (1-18) I, II, III, IV. The Staff (Abildgaard in charge)**

Prerequisite: student in Medical School with consent of in-

structor. Individual research project in pediatric subspecialty areas (cardiology, endocrinology, hematology, me tabolism, 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. (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) III. Stark

Lecture—3 hours; term paper on nonprescription drugs. Prerequisite: some knowledge of basic physiology and biochemistry. Major principles and selected topics in pharmacology; not intended as a comprehensive survey of all drug classes. Oriented specifically to undergraduate and preprofessional school students.

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. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses**200A. Advanced General Pharmacology (3) I, Hance and staff**

Lecture—3 hours. Prerequisite: upper division courses in biochemistry (101A-101B) and mammalian physiology (111A-111B and 112-113 or the equivalent) may be taken concurrently. Core course in human pharmacology designed for graduate and medical students. Principles in pharmacology, including pharmacokinetics and drug metabolism and the actions, use and toxicity of the major classes of drugs.

***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.

200B. Advanced General Pharmacology (4) II. Winters 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.

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.

206. Pharmacokinetics (2) I, Henderson

Lecture—2 hours. Prerequisite: courses 200A, 200B. Physicochemical and physiological factors affecting absorption, distribution, metabolism and excretion of drugs. Mathematical and graphical methods for determining pharmacokinetic parameters. Calculation of dose regimens. Offered in 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.

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.

297T. Tutoring in Pharmacology (1-3) I, II, III. The Staff (Chairperson in charge)

Tutorial—3-9 hours. Prerequisite: courses 200A-200B and 200AL-200BL, or the equivalent; consent of instructor. Under supervision of the instructor, students assist in preparation and teaching of courses in Pharmacology. (S/U grading only.)

298. Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor.

299. Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

Professional Courses**400A. Principles of Pharmacology (4) I, Hance and staff**

Lecture—29 hours; discussion—16 hours; laboratory—16 hours (81 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. Winters 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.)

490. Seminar in Pharmacology for Medical Students (1) I, II, III, IV. The Staff (Chairperson in charge)

Seminar—1 hour. Prerequisite: consent of instructor. Seminar in pharmacology for medical students.

497T. Tutoring in Pharmacology (1-5) I, II, III, IV. Stark

Tutoring—3-15 hours. Prerequisite: advanced standing or consent of instructor. Assist instructor by tutoring medical students in preparation for one of the departmental courses that is a component of the required curriculum of the School of Medicine. (S/U grading only.)

498. Special Study for Medical Students (1-5) I, II, III, IV. 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)

Laboratory—3-36 hours. Prerequisite: consent of instructor. Directed research in pharmacology for medical students. (S/U grading only.)

Physical Medicine and Rehabilitation

Upper Division Courses

192. Internship in Physical Medicine and Rehabilitation (1-12) I, II, III, IV. The Staff (Enrkin coordinator)

Work-learn experience—3-36 hours. Prerequisite: upper division standing; approval of project prior to period of internship by preceptor. Supervised work-learn experience; clinical and "basic" research projects in Physical Medicine and Rehabilitation; emphasis on neuromuscular disorders; final written report. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced standing and consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced standing and consent of instructor. (P/NP grading only.)

Graduate Courses

201A. Sports Medicine: Medical Aspects of Sports Injuries (3) I, Bernauer

Lecture—2 hours; laboratory—1 hour. Prerequisite: graduate students with upper division course in systemic physiology or anatomy, and medical students. Multidisciplinary course introducing student to the pathophysiology of sports injuries, physical examination of the injured athlete, and management of sports injuries. Specific injuries, taping, and use of physical modalities will be discussed. (S/U grading only.) (Same course as Physical Education 201A.)

298. Selected Topics in Rehabilitation and Physical Medicine (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

401A. Sports Medicine: Medical Aspects of Sports Injuries (3) I, Bernauer

Lecture—2 hours; laboratory—1 hour. Prerequisite: medical students with upper division course in systemic physiology or anatomy. Multidisciplinary course introducing student to the pathophysiology of sports injuries, physical examination of the injured athlete, and management of sports injuries. Specific injuries, taping, and use of physical modalities will be discussed. (Same course as Orthopaedic Surgery 401A.)

440. Rehabilitation Medicine Clerkship (3) I, II, III, IV. Lieberman

Clinical clerkship fulltime (2 weeks). Prerequisite: Third- or fourth-year medical student; consent by Committee on Student Evaluation and Promotion. Rehabilitation medicine and geriatrics relating to comprehensive care of the physically disabled and the physical medicine management of neurologic and musculoskeletal disorders. Physiological effects, indications and contraindications of the therapeutic modalities and their application to common musculoskeletal disorders.

451. Rehabilitation Medicine Clinical Elective (5-18) I, II, III, IV. The Staff

Clinical activity—full time. Prerequisite: completion of third year in Medical School; Medical Sciences 430, 431. Intended for non-UC medical students. Emphasis on evaluation of patients with neurological or orthopaedic problems requiring rehabilitative techniques for their management. Introduction to management of such patients. Fourth-year student may function as acting intern on Physical Medicine and Rehabilitation service.

462. Rehabilitation Medicine Clinical Elective (5-18) I, II, III, IV. The Staff

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.

480. Insights in Physical Medicine and Rehabilitation (1-3) I, II, III, IV. The Staff

Clinical experience—3 to 9 hours. Prerequisite: first- and second-year medical students in good academic standing; consent of instructor. Exposure to aims and methods in rehabilitation medicine including ancillary therapies and related services. Development of knowledge and experience of musculoskeletal examination of patients. Observation of ward rounds and outpatient clinics. (S/U grading only.)

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 40 hours per week). Prerequisite: third- or fourth-year medical students; Medical Sciences 430; consent of instructor. Total involvement in patient care involving surgical preparation, treatment, operative care, and follow-up. Developing and understanding reconstruction and aesthetic plastic surgery. Microvascular surgery included. Student rotation.

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 (Chairperson in charge)

Prerequisite: advanced standing and consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: advanced standing and consent of instructor. (P/NP grading only.)

Graduate Courses

226. Psychiatric Implications of Legal Intervention (2) I, III. Bauer

Discussion—2 hours. Prerequisite: consent of instructor. The influence of laws on human behavior, and vice versa, will be explored. Particular emphasis on youth and juvenile court procedure. (Same course as Community Health 226.)

298. Directed Group Study For Graduate Students (1-5) I, II, III, IV. The Staff (Blacker in charge)

Prerequisite: graduate standing and consent of instructor.

299. Special Study for Graduate Students (1-12) I, II, III, IV. The Staff (Blacker in charge)

Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses

401. Behavioral Aspects of Medicine (5) III. Steward

Lecture—28 hours total; discussion—2 hours total; seminar—10 hours total; independent study—20 hours total. Prerequisite: core course for first-year medical students. Overview of healthy growth/development through the life cycle; interaction of biological, psychological, social, cultural factors influencing the health-illness continuum at different stages of the life cycle; psychosocial and cultural factors affecting/effecting physician-patient interaction.

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. Maddock 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.)

412. Psychiatry Grand Rounds (1) II, III, IV. Doran 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. Outpatient Psychiatry Clerkship (6-12) I, II, III, IV. Doran and staff

Clinical experience—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 and/or consent of instructor. Clinical management of adult outpatients, including initial evaluation, differential diagnosis, and treatment planning, in addition to

brief psychotherapy and interviewing skills. Conferences, medication clinics, and videotaping under supervision.

414. Consultation-Liaison Clerkship (6-12) I, II, III, IV. Doran and staff

Clinical experience—full time (4 to 8 weeks). Prerequisite: Medical Sciences 433 and/or consent of instructor. Student functions as member of the team in evaluation, management, and psychiatric liaison with other medical specialties. Intensive supervision from senior staff and psychiatric residents.

415. Crisis Intervention (6-12) I, II, III, IV. Doran

Clinical activity—full time (4 to 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.

416. Child Psychiatry Clerkship (6-12) I, II, III, IV. Doran and staff

Clinical experience—full time (4 to 6 weeks). Prerequisite: Medical Sciences 433 and/or consent of instructor. Didactic and clinical inpatient, outpatient, and consultation-liaison experiences with children, adolescents and families. Clinical observations, diagnostic assessment, and treatment will be undertaken with close supervision. Literature review and case conferences presented on a regular basis.

417. Jail Psychiatric Clerkship (6 or 12) I, II, III, IV. Doran and staff

Clinical experience—full time (4 to 8 weeks). Prerequisite: Psychiatry Core Clerkship and/or consent of course coordinator. Students gain experience, under close faculty supervision, assessing acute and chronic mentally ill inmates in both inpatient and clinic settings.

418. Off-Campus Clinical Experience (6-12) I, II, III, IV. Doran and staff

Clinical activity—full time (4 to 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) 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. Acting Internship in Psychiatry (6 or 12) I, II, III, IV. Doran and staff

Clinical experience—full time (4 to 8 weeks). Prerequisite: Psychiatry Core Clerkship and/or consent of course coordinator. Acting intern position on the UCD Medical Center Inpatient Unit. Close faculty supervision with emphasis on biological psychiatry, psychopharmacology and psychodynamic aspects appropriate to diagnostic and long-term patient management.

421. Advanced Psychiatry Clerkship: Martinez VA Hospital (12) I, II, III, IV. Doran 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.

422. Readings in Psychiatry (1-3) I, II, III, IV. Doran and staff

Readings-discussion—3 to 9 hours. Independent reading of a selected topic in psychiatry. Supervision and discussion with a psychiatry faculty member. (S/U grading only.)

480. Insights in Psychiatry (1-3) I, II, III, IV. Chapman

Clinical activity—3-9 hours. Prerequisite: first- or second-year medical student in good academic standing; consent of instructor. On individual basis, student provided with an opportunity for gaining insight into various clinical activities in the practice of psychiatry. (S/U grading only.)

***498. Directed Group Study (1-5)** I, II, III, IV. Blacker and staff

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. Doran and staff

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 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.)

413. Physics of Diagnostic Radiology (5) III. Seibert, Liedholdt,

Lecture—49 hours total; laboratory—6 hours total. Prerequisite: consent of instructor. Physics of diagnostic imaging; x-ray production and interaction; image formation; modulation transfer function; fluoroscopy; cine fluoroscopy; stereoscopy; xeroradiography; computerized and geometrical tomography; magnetic resonance and ultrasound. Principles of radiation protection in imaging will be covered. Offered at VA Hospital, Martinez. (S/U grading only.)

414. Medical Radiation Biology (3) IV. Bushberg, Goldman, Liedholdt

Lecture—27 hours total. Prerequisite: consent of instructor. Medical radiation biology; molecular cellular and organ system response to acute and chronic irradiation; radiation carcinogenesis and genetic effects; radiation risk assessment; diagnostic ultrasound and magnetic resonance imaging health effects. Medical/legal considerations of radiation exposure. Offered at VA Hospital, Martinez. (S/U grading only.)

415. Radiopharmacy (3) IV. Vera

Lecture—3 hours. Prerequisite: consent of instructor. Fundamentals of radiopharmaceutical science including radiochemistry; radiopharmaceutical production; theory; applications; mechanisms of localization, radionuclide and radiopharmaceutical drug applications and related regulatory aspects. (S/U grading only.)

420. Radiologic Diagnosis I (1) II. Ablin

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. Ablin

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. Link

Clinical activity—full time (3 days per unit). Prerequisite: completion of third year of Medical School; consent of instructor. Student works with radiologists at UCD Medical Center in film reading sessions and radiological procedures; includes fluoroscopy, vascular radiology and special investigations. Includes daily individual teaching sessions with faculty radiologists, radiology learning laboratory, and all-radiology conferences and seminars. Limited enrollment.

498. Group Study in Diagnostic Radiology (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor.

499. Research in Diagnostic Radiology (1-12) I, II, III, IV. The Staff

Prerequisite: consent of instructor.†

Radiology—Nuclear Medicine

Upper Division Courses

101. **Biomedical Radiochemistry** (3) III. The Staff
Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor. Course is designed to combine basic nuclear physics, chemistry, and biology into a comprehensive and vigorous lecture-laboratory experience in biomedical nuclear chemistry. Subjects include choice and purification of appropriate gamma and beta radioisotopes, compounding biological pharmacodynamics and radioimmunoassay. (Same course as 401.)

198. **Directed Group Study** (1-5) I, II, III, IV. The Staff (S. DeNardo in charge)
Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

199. **Special Study for Advanced Undergraduates** (1-5) I, II, III, IV. The Staff (Stadlnik in charge)
Prerequisite: upper division standing and consent of instructor. (P/NP grading only.)

Graduate Course

299. **Research: Special Study for Graduate Students** (1-12) I, II, III, IV. The Staff (Director in charge)
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses

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 Committee 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.)

401. Biomedical Radiochemistry (3) III. The Staff

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.)

411. Physics of Nuclear Medicine (5) I, Bushberg, Liedholdt

Lecture—43 hours total; laboratory—12 hours total. Prerequisite: consent of instructor. Physics of diagnostic and therapeutic nuclear medicine, nuclear physics, radioactive decay; interaction of ionizing radiation; dosimeters; attenuation; internal and external dosimetry; health physics; radiation detection and imaging, scintillation cameras, computerized planar and tomographic imaging. Offered at VA Hospital, Martinez. (S/U grading only.)

463. Clinical Clerkship in Nuclear Medicine (9 or 18) I, II, III, IV. Stadlnik

Clinical activity—full time (3 days per unit). Prerequisite: satisfactory completion of second year of Medical School or the equivalent; consent of instructor. Clerkship correlates radioisotopic methods with clinical, pathophysiological, 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 (Stadlnik in charge)

Prerequisite: consent of instructor.†

499. Research in Nuclear Medicine (1-12) I, II, III, IV. The Staff (Stadlnik in charge)

Prerequisite: consent of instructor.†

Radiology—Therapeutic

Graduate Course

299. Independent Study and Research (1-12) I, II, III, IV. The Staff (Chairperson in charge)

Prerequisite: enrollment with Biophysics Group for Ph.D. candidacy, and consent of group adviser and sponsor. (S/U grading only.)

Professional Courses

*464. Clinical Clerkship Elective (9 or 18) I, II, III, IV.

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.

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. (P/NP grading only.)

Graduate Course

299. **Research** (1-12) I, II, III, IV. Wolfe in charge
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses

419. **Introduction to Clinical Surgery** (1-6) I, II, III, IV. Ward
Clinical activity—full time. Prerequisite: second-year medical student with consent of instructor. Designed to introduce medical students to basic principles of surgical practice and the most common surgical diseases. Course will afford opportunity to review surgical patients and discuss them with members of staff.

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** (3-9) I, II, III, IV. The Staff
Clinical experience—full time (2 to 6 weeks). Prerequisite: fourth-year medical student or third-year medical student with completion of Medical Sciences 430. Preparation of patients, treatment, operative care, and postoperative follow-up. Services include Surgery Clinics, Surgical Nutrition, Pediatric Surgery, Cardiothoracic Surger, Gastrointestinal Surgery, and Burn 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 (3-9) I, II, III, IV. Goodnight and staff.

Clinical instruction—full time (2 to 6 weeks). Prerequisite: fourth-year medical student or third-year medical student with completion of Medical Sciences 430. Student learns medical and surgical principles applicable to cancer. Participation in the care and major surgical oncologic problems; and opportunity to learn the medical, radiologic, and surgical approaches to cancer therapy.

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.

480. **Insights in Surgery** (1-3) I, II, III, IV. The Staff
Clinical experience—3 to 9 hours. Prerequisite: good aca-

demetic standing and consent of instructor. Individualized activities, including ward rounds, subspecialty clinics and conferences, grand rounds, and observation of a variety of surgical procedures. (S/U grading only.)

494H. Fourth-Year Surgical Honors Program (18) I, II, III, IV. 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 in termship and residency training. (S/U grading only.)

498. Group Study (1-5) I, II, III, IV.

Prerequisite: medical student; consent of instructor. Directed reading and discussion and/or laboratory investigation on selected topics.

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. (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. (P/NP grading only.)

Graduate Course

299. Research in Urology (1-12) I, II, III, IV. Deitch, deVere White in charge
Prerequisite: graduate standing and consent of instructor. (S/U grading only.)

Professional Courses

400. Office Urology (1) I, II, III, IV. deVere, White
Clinical activity—4 hours in afternoons (6 weeks). Prerequisite: fourth-year medical students with consent of instructor. Introduction to ambulatory care of urologic patients including basic therapeutic and diagnostic procedures from case material referred to private clinic. Management of urinary tract infection will be emphasized.

420. Urinary System (3.5) III. Stone, Bogusky
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. deVere, White
Clinical activity—full time. Prerequisite: second-year medical student; physical diagnosis or the equivalent; consent of instructor. Clinical experience in diagnosis and treatment of urologic disease. Student will work closely with house staff, participate in conferences and surgery, and perform initial patient evaluation on new patients. May be repeated for credit. Limited enrollment.

461. Externship in Urology (5-18) I, II, III, IV. deVere, White
Clinical activity—full time. Prerequisite: fourth-year medical students with consent of instructor. Under supervision, student acting as intern will assume full inpatient responsibility including admission history, physical examination, management of hospitalization, and participate in surgical procedures, outpatient clinic and learning diagnostic and therapeutic procedures. May be repeated for credit.

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.

499. Research in Urology (1-12) I, II, III, IV. Deitch, deVere White, E.L. Lewis, Palmer, Stone
Research—3-36 hours. Prerequisite: medical or veterinary medical students with consent of instructor. Research in oncology, male infertility, urodynamics, neurogenic bladder.

Unique opportunity to apply recent technologies (nuclear medicine resonance, flow cytometry, recombinant DNA) in investigation, diagnosis and treatment of GU cancer, infectious disease, male infertility and development of genitourinary bioprosthesis.

Medicine

(School of Veterinary Medicine)

Anthony A. Stannard, D.V.M., Ph.D., Chairperson of the Department

Department Office, 2106 Medical Science 1A (752-1363)

Faculty

- Alexander A. Ardans, D.V.M., M.S., Professor
- Dale L. Brooks, D.V.M., Ph.D., Lecturer
- Gary P. Carlson, D.V.M., Ph.D., Professor
- Larry D. Cowgill, D.V.M., Ph.D., Associate Professor
- Nancy E. East, M.S., D.V.M., M.P.V.M., Assistant Professor
- Pamela H. Eisele, D.V.M., Assistant Clinical Professor
- Laurence R. Enos, Pharm.D., Lecturer
- Murray E. Fowler, D.V.M., Professor
- John M. Gay, D.V.M., Ph.D., Assistant Professor
- Lisle W. George, D.V.M., Ph.D., Associate Professor
- Ronald P. Hedrick, Ph.D., Associate Professor
- Roy V. Henrikson, D.V.M., Lecturer
- David E. Hinton, Ph.D., Professor
- Charles A. Hjerpe, D.V.M., Professor
- Peter J. Ihrke, V.M.D., Associate Professor
- Mark D. Kittleson, D.V.M., M.S., Ph.D., Assistant Professor
- D. J. Lauren, M.S., Ph.D., Assistant Adjunct 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, D.V.M., Professor Emeritus
- 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
- Edward A. Rhode, D.V.M., Professor
- Jeffrey A. Roberts, D.V.M., Assistant Clinical Professor
- Bradford P. Smith, D.V.M., Professor
- Michael S. Spensley, D.V.M., Assistant 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., Associate Professor
- Fred H. Trout, V.M.D., Ph.D., Professor (Medicine, Epidemiology and Preventive Medicine, Director, VMTRC)
- Leon D. Weaver, V.M.D., Senior Lecturer
- James F. Wilson, D.V.M., J.D., Lecturer
- W. David Wilson, B.V.M.S., M.R.C.V.S., Assistant Professor
- William W. Wingfield, M.S., Ph.D., Assistant Adjunct Professor

Part-Time Clinical Faculty

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 (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

***290. Seminar in Veterinary Medicine** (1) I, II, III. The Staff (Chairperson 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 (Chairperson 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, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Resident responsible for diagnoses, medical and surgical treatment of animals in the wards and outpatient clinic, including history taking, physical examinations, laboratory tests, special diagnostic and therapeutic procedures, and consultations, under the direction of the senior staff. May be repeated for credit. (S/U grading only.)

402. Large Animal Medicine (1½ per week) I, II, III. The Staff (Smith in charge)
Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for the medical care of patients in the VM Teaching Hospital and outpatient clinics under the direction of the senior staff of the hospital. May be repeated for credit. (S/U grading only.)

403. Small Animal Medicine (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 in charge
Laboratory—50 hours total. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents apply their knowledge of veterinary medicine, animal nutrition, genetics, husbandry, management, and economics on a herd basis toward the improvement of food animal production efficiency through control and prevention of disease. (S/U grading only.)

421. Veterinary Dermatology (¾ per week) I, II, III. Stannard
Laboratory—25 hours. Prerequisite: professional standing, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents are responsible for patient care in the hospital and outpatient clinic including history taking, physical examinations, and diagnostic procedures under the direction of the staff dermatologist. (S/U grading only.)

***423. Pulmonary Diseases** (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, resident in Veterinary Medical Teaching Hospital, or consent of instructor. Residents responsible for assisting in handling and treatment of clinic cases and for learning the techniques of manual and chemical restraint of a wide variety of mammals, birds, reptiles, and fish. Medication problems, anesthetic techniques and surgical procedures will be discussed and practiced. (S/U grading only.)

491. Small Animal Grand Rounds (¾) I, II, III. The Staff (Ling in charge)
Discussion—1 hour. Prerequisite: professional standing Resident in Veterinary Medical Teaching Hospital or consent of instructor. Residents take an active part in the presentation and discussion of selected cases from the small animal clinic. May be repeated for credit. (S/U grading only.)

492. Large Animal Grand Rounds (½) I, II, III. The Staff (Carlson in charge)
Discussion—1 hour. Prerequisite: professional standing as resident in Veterinary Medical Teaching Hospital or consent of instructor. Residents take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. May be repeated for credit. (S/U grading only.)

493. Seminar in Veterinary Medicine (1) I, II, III. The Staff (Cowgill and Smith in charge)
Seminar—2 hours. Prerequisite: professional standing; resident in Veterinary Medical Teaching Hospital. Seminars given by the faculty of the School of Veterinary Medicine in topics relating directly to the practice of clinical medicine and surgery. Residents will assist in the presentation of seminar material. May be repeated for credit. (S/U grading only.)

Medieval Studies

(College of Letters and Science)

Dennis J. Dutschke, Ph.D., Program Director
 Program Office, 922 Sproul Hall (752-1219)

Committee in Charge

- Samuel G. Armistead, Ph.D. (*Spanish*)
- Dennis J. Dutschke, Ph.D. (*Italian*)
- Ingeborg Henderson, Ph.D. (*German*)
- ^{2,3}Winder McConnell, Ph.D. (*German*)
- David A. Nutter, Ph.D. (*Music*)
- Marijane Osborn, Ph.D. (*English*)
- Alan A. Stambusky, Ph.D. (*Dramatic Art*)

The Major Program

The major in Medieval Studies is designed to introduce students to the main features of European civilization during the period from the fall of Rome to the 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:

Preparatory Subject Matter	UNITS
Recommended: Art 1B, History 4A, Philosophy 21, Medieval Studies 20A, 20B, 20C, Religious Studies 10.	
Language proficiency is a necessity; courses in Latin and other European languages are strongly recommended, particularly for students planning to pursue graduate studies in the medieval field.	
Depth Subject Matter	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, 113A, 113B, 150A, 188, 189.	
(b) French 115, 141.	
(c) German 120, 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 and Communication 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. D. J. Dutschke (*Italian*), W. McConnell (*German*), J. J. Murphy (*Rhetoric*), M. Osborn (*English*).

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*. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Art 1B, History 4A, or Comparative Literature 1 or 2.
- 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*. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Art 1B, History 4A, or Comparative Literature 1 or 2.

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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Art 1B, History 4A, or Comparative Literature 1 or 2.

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-D, 120E, *120F. The Medieval World** (4) I, II, III. The Staff (Chairperson in charge)

Lecture—2 hours; discussion—1 hour; term paper. Course deals with selected themes from the Middle Ages; the Fall of Rome to the beginning of the Renaissance. Subjects will vary from year to year and cover such topics as

- *(A) The Monastic Orders;
- *(B) Origins of Universities;
- *(C) The Seven Liberal Arts, and their Significance in the Middle Ages;
- *(D) Family and Society;
- (E) Chivalry; and
- *(F) Church and State.

General Education credit for course 120E: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Medieval Studies 20A, 20B, 2C, or English 3

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

See Chicano Studies

Microbiology

See Microbiology, below; Microbiology (A Graduate Group); Medical Microbiology; and Veterinary Microbiology and Immunology

Microbiology

(College of Letters and Science)

David Pratt, Ph.D., Acting Chairperson of the Department

Department Office, 156 Hutchison Hall (752-0262)

Faculty

- Stanley W. Artz, Ph.D., Associate Professor
- Paul Baumann, Ph.D., Professor
- Robert E. Hungate, Ph.D., Professor Emeritus
- John L. Ingraham, Ph.D., Professor
- *JaRue S. Manning, Ph.D., Professor
- Allen G. Marr, Ph.D., Professor
- John C. Meeks, Ph.D., Associate Professor
- Douglas C. Nelson, Ph.D., Assistant Professor
- Herman J. Phaff, Ph.D., Professor Emeritus (*Food Science and Technology*)
- Wiltraud J.C. Pfeiffer, Ph.D., Senior Lecturer (*Microbiology, Biological Sciences*)
- David Pratt, Ph.D., Professor
- Martin L. Privalsky, Ph.D., Associate 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, with appropriate courses in mathematics and physical science. Both the Bachelor of Arts and the Bachelor of Science programs are suitable for students who wish a professional career in bacteriology, microbiology or an allied field, as well as, graduate education in most biological science disciplines.

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 microbiology.

Students majoring in Microbiology 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.

Microbiology

A.B. Major Requirements:

Preparatory Subject Matter	UNITS
Microbiology 2 or 102, 3 or 102L	4-6
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 6A, 6B, 6C.	
Depth Subject Matter	36-37
Microbiology 105, 130A; 110-110L or 120-120L or 130B-130L or 177-177L	13-14
Biochemistry 101A, 101B, 101L	12
Genetics 100	4
Additional units from Microbiology 110-110L, 120, 120L, 130B, 130L, 177, 177L; Microbiology 162; Botany 114, 118, 119; Veterinary Microbiology 127, 128	8
Total Units for the Major	86-91

Microbiology

B.S. Major Requirements:

Preparatory Subject Matter	UNITS
Microbiology 2 or 102, 3 or 102L	53-58
Biological Sciences 1	4-6
Chemistry 1A, 1B, 1C, 5	5
Statistics 13	19
Mathematics 16A, 16B, 16C; or 21A, 21B, 21C	4
Physics 6A-6B-6C	9-12

Depth Subject Matter	53-55
Microbiology 105, 130A; 110-110L or 120-120L	
or 130B-130L or 177-177L	13-14
Biochemistry 101A, 101B, 101L	12
Chemistry 107A, 107B, 128A, 128B, 128C, 129A	17
Genetics 100	4
Microbiology 162 or Veterinary Microbiology 128	3-4
Additional units from Microbiology 120, 120L, 110, 110L, 130B, 130L, 177, 177L	5
Recommended: Chemistry 108; a course in computer programming.	

Total Units for the Major 106-113

Breadth Subject Matter

<i>College of Agricultural and Environmental Sciences students</i>	24
English and/or rhetoric	8
Social sciences and/or humanities	16
See also the College section for additional requirements.	

College of Letters and Science students:
Refer to the College section for a description of requirements to be completed in addition to the major.

Major Advisers. W.J.C. Pfeiffer, D. Pratt, M.L. Wheelis.

Honors and Honors Program. Contact a major adviser from those listed above.

Teaching Credential Subject Representative. W.J.C. Pfeiffer. See also 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 microbiology. The offerings of the Department of Microbiology 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 Microbiology.

Related Courses. For other courses related to Microbiology 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 Microbiology also teach or participate in the following courses: Biological Sciences 1, 10 and 19.

Courses in Microbiology

Lower Division Courses

- 2. General Bacteriology (3) I, II, III.** The Staff
Lecture—3 hours. Prerequisite: Biological Sciences 1. The biology of bacteria with some of its applications. Not open for credit to students who have completed course 102.
- 3. Bacteriological Laboratory Techniques (1) I, II, III.** The Staff
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.)
- 20. Biology of the Bacteria (3) I, Wheelis**
Lecture—3 hours. Prerequisite: Biological Sciences 10. Survey of the diversity of bacteria—their metabolism, genetics, and habitats. Emphasis on importance to humans—role of bacteria in global element cycles, in food production and in disease. Not intended for students majoring in the natural

sciences. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10.

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

Upper Division Courses

102. General Bacteriology (4) I. Wheelis
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.

102L. General Bacteriology Laboratory (2) I, Pfeiffer
Laboratory—6 hours. Prerequisite: course 2 or 102 (may be taken concurrently); Chemistry 8B. Introduction to principles and laboratory methods employed in working with microorganisms. For students planning to continue study of microbiology, or use microorganisms as tools for study of genetics and biochemistry. Only one unit of credit allowed if Microbiology 3 has been taken.

105. Bacterial Diversity: Morphology, Systematics, Habitats (5) I, Nelson
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.

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. Offered in odd-numbered years.

120. Microbial Ecology (3) III. Meeks
Lecture—3 hours. Prerequisite: course 105; Biochemistry 101A. Interactions between non-pathogenic microorganisms and their environment, emphasizing physiological and metabolic characteristics of various groups and their adaptation to and modification of specific habitats.

120L. Microbial Ecology Laboratory (2) III. Meeks
Laboratory—6 hours; one optional overnight weekend field trip. Prerequisite: course 120 (may be taken concurrently); consent of instructor. Study of prokaryotic microorganisms from certain habitats. One-half of laboratory effort will consist of organized experiments on ecologically important microbial activities. For remaining one-half, research projects will be done on student selected specific habitats of microorganisms. Limited enrollment.

130A. Bacterial Physiology and Genetics (3) II. Ingraham
Lecture—3 hours. Prerequisite: course 2 or 102; Biochemistry 101B (may be taken concurrently); Genetics 100; Mathematics 16A. Physiology and regulation of bacterial growth including the effect of the environment. Mapping techniques and use of mutants in problem solving.

130B. Bacterial Physiology and Genetics (3) III. Artz, Ingraham
Lecture—3 hours. Prerequisite: course 130A. Gene regulation. Prokaryotic nitrogen metabolism. Structure and function of the bacterial cell envelope; synthesis of peptidoglycan and lipopolysaccharide; active transport of nutrients; chemotaxis.

130L. Bacterial Physiology Laboratory (3) III. 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.

162. General Virology (4) I, Pratt, Manning, Bruening (Plant Pathology)
Lecture—4 hours. Prerequisite: Biological Sciences 1; Genetics 100 and Biochemistry 101B recommended. Integrated presentation of the nature of animal, bacterial, and plant viruses, including their structure, replication and genetics.

177. Metabolism of Anaerobic Bacteria (3) II. Macy (Animal Science)
Lecture—3 hours. Prerequisite: course 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 even-numbered years.

190C. Undergraduate Research Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion/conference—1 hour. Prerequisite: upper division standing; consent of instructor. Presentation and critical discussion of staff research activities: designed for advanced undergraduate students. May be repeated for a maximum of 3 units of credit when subject matter differs. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
Laboratory—3-36 hours. Technical and/or professional experience on or off campus. Supervised by a member of the Microbiology 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 Microbiology; consent of chairperson. Assist in undergraduate laboratory courses supervised by teaching assistants or faculty; in discussion sections supervised by faculty; and staffing "drop-in" offices for individual help. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

200A-200B-200C. Microbiology for First-Year Graduate Students (3-3-3) I-II-III. The Staff (Chairperson in charge)
Lecture—3 hours. Prerequisite: first-year graduate standing with interest in Microbiology. A survey of general microbiology at the graduate level.

215. Recombinant DNA (2) I, Privalsky
Lecture—2 hours. Prerequisite: courses 130A-130B or Biochemistry 101A-101B; Genetics 100. 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 100; and consent of instructor. Application of the recombinant DNA technology to modern problems in biology, biochemistry and genetics, emphasizing molecular cloning strategies, choice of vectors, preparation of insert DNA and selection procedures. (Submit application, available from Microbiology Department Office, two weeks prior to first day of class.)

***240. Biology of Autotrophic Prokaryotes (3) I, Meeks, Wheelis**
Lecture-discussion—3 hours. Prerequisite: Biochemistry 101B. Biochemistry and ecology of photo- and chemoautotrophic bacteria, and of methylotrophic bacteria, with special emphasis on the mechanisms of ATP and reductant generation. Offered in odd-numbered years.

***250. Biology of Yeasts (5) I, Bisson (Viticulture and Enology), C. Price (Food Science and Technology)**
Lecture—3 hours; laboratory—6 hours. Prerequisite: consent of instructor. Survey of the genetics, physiology, regulatory mechanisms, structure, ecology and diversity of yeasts and related organisms. Offered in 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, Privalsky
Lecture—3 hours. Prerequisite: consent of instructor. Selected advanced topics on biological and biochemical properties of animal viruses. May be repeated for credit. Offered in odd-numbered years.

290C. Advanced Research Conference (1) I, II, III. The Staff (Chairperson in charge)
Discussion/conference—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and critical discussion of staff research activities. Designed for advanced

graduate students. May be repeated for credit. (S/U grading only.)

291. Selected Topics in Bacteriology (1) I, II, III. The Staff (Chairperson 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, II, III. The Staff
Seminar—1 hour. Prerequisite: consent of instructor. Review and discussion of current literature and developments in bacterial physiology, genetics, and virology with presentations by individual students. (S/U grading only.)

***296. Seminar in Animal Virology** (1) II. Manning, Privalsky
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 (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.)

Microbiology (A Graduate Group)

John C. Meeks, Ph.D., Chairperson of the Group
Group Office, 156 Hutchison Hall (Microbiology Department), (752-0262)

Graduate Study. The Graduate Group in Microbiology offers study and research leading to the M.S. and Ph.D. degrees. For information on the graduate study and undergraduate preparation for the program contact a graduate adviser or the Chairperson of the group. See also the Graduate Division section in this catalog.

Graduate Advisers. B. L. Beaman (*Medical Microbiology*); R.B. LeFebvre (*Veterinary Microbiology and Immunology*); D.C. Nelson (*Microbiology*); D.M. Ogrzydzak (*Food Science and Technology*).

Courses in Microbiology

Graduate Courses

290C. Advanced Research Conference (1) I, II, III. The Staff (Meeks in charge)
Discussion-conference—1 hour. Prerequisite: graduate standing and/or consent of instructor. Presentation and critical discussion of staff research activities. Designed for advanced graduate students. May be repeated for credit. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff
Research under the guidance of dissertation committee. (S/U grading only.)

Military Science

(College of Letters and Science)

Reserve Officers' Training Corps (ROTC), Army

Douglas M. Crawford, Lt.Col., Chairperson of the Department

Department Office, 125 Hickey Gymnasium (752-0541)

Faculty

Lieutenant Colonel Douglas M. Crawford, Professor
Major John F. Campbell, Assistant Professor
Major James E. Guffey, Assistant Professor
Major Jane P. Morey, Assistant Professor
Major C. Scott Prosuch, 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 in one of seventeen career fields (i.e., Infantry, Engineer, Aviation, Medical Service Corps, Armor, Military Intelligence, etc.). Active duty obligation for ROTC graduates will not exceed four years for those who choose Active Duty or six months for those who choose Reserve Component Duty. The total combined service obligation is eight years.

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 (basic camp) between their third and fourth years of the course. Emphasis is on individual participation, leadership development and the capability to function effectively in positions of significant responsibility.

Two-Year Program

This program is designed for students who have not attended lower division Military Science classes. In lieu of lower division courses an applicant attends a six-week summer camp (Basic Camp) which is voluntary and carries no military obligation. Applicants are paid for camp attendance and transportation costs. Applications are accepted during the winter and spring terms of the year preceding enrollment in the two-year program. All other provisions explained above for the upper division course apply to the two-year program.

Scholarship Program

The U.S. Army offers four-, three-, and two-year Active Duty and Reserve Forces Duty scholarships to students planning to attend or attending UC Davis. The U.S. Army ROTC scholarship pays for your college tuition, laboratory fees, on-campus education fees, attendance at Advanced Camp, and a flat rate amount from which you may purchase textbooks, classroom supplies and equipment. Scholarship winners also receive a tax-free subsistence allowance of \$100 a month for 10 months for each year that the scholarship is in effect.

The Army Reserve Officers' Training Corps four-year Active Duty merit scholarships are awarded to qualified high school seniors in a national competition each year. There are two cycles available for submission of the four-year scholarship application. High school juniors can compete for an Early Cycles scholarship by submitting their application complete and postmarked by 15 July between their junior and senior years. Applicants will receive notification of their final status by 1 November. As

high school seniors, students compete for the Regular Cycle scholarship by submitting their application complete and postmarked by 1 December. Those applicants not selected in the Early Cycle are considered in the Regular Cycle competition. Applicants will receive notification of their final status by 1 March of their senior year in high school. Interested applicants should see their high school counselor for an application or contact UC Davis, Department of Military Science.

The three-year Active Duty and two-year Active and Reserve Forces Duty scholarships are awarded to college students who are already attending UC Davis or transferring from a Junior College to UC Davis, and have three or two years remaining before graduating with a baccalaureate. Students interested in competing for these scholarships can submit their application beginning in November of each school year. The deadline for submission of an application is 15 January for the two-year scholarship and 15 February for the three-year scholarship. Additionally, students may win a two-year scholarship at the six-week summer camp (Basic Camp) in the Two-Year Program mentioned above. Students apply for these Army scholarships through the Military Science Department.

DASE Cooperative Program

The Department of the Army Scientific and Engineering (DASE) Cooperative Program is designed to support the U.S. Army's efforts to recruit, employ, and retain a science and engineer skilled work force as both military officers and civilian employees.

Qualified students may receive financial assistance of up to \$5,000 per year to pay for tuition, fees, books, lodging, and meals. Additionally, a \$1,000 per year stipend is paid to ROTC Advanced Course students during their last two years in school.

DASE Cooperative students must work in a Department of the Army (DA) Civilian position for a minimum of 26 weeks, typically divided into two thirteen week periods. At least one work period should be completed during the school year. While working, the DASE student will receive the regular pay and benefits for their grade.

Students must be enrolled full time in an undergraduate program leading to a degree in either science or engineering and enroll, or be enrolled, in the U.S. Army Senior ROTC Program. A first semester freshman applicant needs a high school minimum cumulative grade point average (GPA) of 2.75 on a 4.0 scale and a recommendation from the principal or guidance counselor. Other university applicants must have a 2.0 GPA and a minimum C average in all major fields of study. The DA civilian employers may set their standards above these averages.

Upon graduation and commissioning students must repay tuition assistance. Students choose to serve in either the Active Army or a Reserve Forces Component and apply for available DA Civilian positions for a specified period of employment.

For complete information you may contact the Military Science Department or the Planning and Placement Work Learning and Career Center, the Engineering and Physical Science Program Manager.

Leadership Laboratory

During the course of the school year, several weekends and two hours per week are spent in the conduct of practical exercises. Classes emphasize adventure activities including offense, defense and patrolling techniques, weapons familiarization, rappelling, rope bridging, obstacle courses, leadership reaction course, and land navigation. All cadets are required to attend leadership laboratories for practical leadership experience and to prepare for attendance at the Army ROTC Advance Camp.

Academic Credit

College of Letters and Science. The Bachelor of Arts degree requires the completion of 180 units.

Military Science courses are counted in the allowance for electives.

College of Agricultural and Environmental Sciences. The Bachelor of Science degree in agriculture requires the completion of 180 units. Military Science courses are counted in the unit allowance for electives.

College of Engineering. Military Science units are acceptable toward the requirements for the Bachelor of Science degree to the extent of the unrestricted elective units available in the curriculum being followed.

School of Veterinary Medicine. The number of Military Science units acceptable toward the Bachelor of Science degree in Veterinary Medicine is on an individual program basis approved by the Dean of the School. Graduates with the D.V.M. degree may apply for direct commission in the United States Army Veterinary Corps.

Courses in Military Science

Lower Division Courses

11. Roles and Organization of the U.S. Army (1) I.

Lecture—1 hour. Prerequisite: lower division status. Constitutional and legal basis of the Army, organization and strategic roles in times of war and peace, and "total Army" concept. Impact of civil-military relations and Soviet military power on role of Army studied in context of current problems.

12. Introduction to Military Leadership and Map Reading (1) II.

Lecture—1 hour. Prerequisite: lower division status. Introduction to leadership theories used in military organizations. Course surveys the duties and responsibilities of junior Army officers, the general environment that officers lead, and the leadership roles performed. Introduces military map reading.

13. Introduction to Basic Military Operations (1) III.

Lecture—1 hour. Prerequisite: lower division status. Basic military tactical theories and their application at the individual and squad level. Course introduces military tactical operations, and covers military first aid. Principles of war as introduced in course 11 are applied to offensive and defensive tactics.

14A. Introduction to Military Leadership Skills (1/2) I.

Laboratory—2 hours. Prerequisite: lower division status and consent of instructor. Personal and organizational leadership skills introduced in leadership laboratory. Extensive supervised leadership experiences conducted in a military environment. Basic military skills necessary to function in a leadership role are also covered. (P/NP grading only.)

14B. Introduction to Military Leadership Skills (1/2) II.

Laboratory—2 hours. Prerequisite: lower division status and consent of instructor; completion of all previous laboratories. Development of leadership and military skills introduced in course 14A is continued with emphasis on the individual's role in the squad, the basic organizational element of the Army. As students gain capabilities, supervisory controls are reduced. (P/NP grading only.)

14C. Introduction to Military Leadership Skills (1/2) III.

Laboratory—2 hours. Prerequisite: lower division status and consent of instructor; completion of all previous laboratories. Students demonstrate skill levels required for promotion to non-commissioned officer level. Use of chain of command from company through individual levels emphasized. Interrelationship of squad and platoon organizations is explored. (P/NP grading only.)

21. Military History (2) I.

Lecture—2 hours. Prerequisite: lower division status; course 11 or consent of instructor. Survey of military history from 1900 to present, focusing on World War I, World War II, the Korean War, and the Vietnam War.

22A. Intermediate Military Leadership and Operations: I (2) II.

Lecture—2 hours. Prerequisite: lower division status; course 11 or consent of instructor. Develops and exercises personal military leadership skills in extensive supervised leadership laboratories. Intermediate level military skills necessary for leadership roles as junior non-commissioned officers are developed. Students perform in role of junior non-commissioned officers.

22B. Intermediate Military Leadership and Operations: II (2) III.

Lecture—2 hours. Prerequisite: lower division status; course 22A or consent of instructor. Continuation of course 22A. Individual leadership traits identified in course 22 are studied in more depth enabling each student to improve on targeted weaknesses. Instruction is presented in intermediate defensive tactics at the squad level.

24A. Individual Military Leadership Skills (1/2) I.

Laboratory—2 hours. Prerequisite: lower division status; courses 14A, 14B, 14C and 21, or consent of instructor. Develops and exercises personal military leadership skills in extensive supervised leadership laboratories. Intermediate level military skills necessary for leadership roles as junior non-commissioned officers are developed. Students perform in role of junior non-commissioned officers. (P/NP grading only.)

24B. Individual Military Leadership Skills (1/2) II.

Laboratory—2 hours. Prerequisite: lower division status; courses 14A, 14B, 14C and 21, or consent of instructor. Personal supervisory and leadership styles are developed in a supervised laboratory environment. Students are rotated through squad and team-level supervisory positions, given responsibility concomitant with positions. (P/NP grading only.)

24C. Individual Military Leadership Skills (1/2) III.

Laboratory—2 hours. Prerequisite: lower division status; courses 14A, 14B, 14C and 21, or consent of instructor. Students are prepared for transition from junior leader to senior non-commissioned officer. Chain of command and hierarchical responsibilities and reporting requirements are demonstrated in a laboratory setting. (P/NP grading only.)

Upper Division Courses

131. Advanced Military Leadership and Management (2) I.

Lecture—2 hours. Prerequisite: upper division status; course 22A or consent of instructor. Course addresses different types of power and influence a military leader may use, reviews counseling techniques, and introduces basic management skills. Instruction provided on the various branches in which a commissioned officer could serve.

132A. Advanced Military Operations (2) II.

Lecture—2 hours. Prerequisite: upper division status; course 22B or consent of instructor. First phase of advanced military tactical operations. Advanced work on topographical maps, navigation, and orienteering techniques. Instruction is also provided on resource planning techniques and military intelligence.

132B. Advanced Military Operations (2) III.

Lecture—2 hours. Prerequisite: upper division status; course 132A or consent of instructor. Continuation of course 132A. Military tactical theories and their application in offense and defense are presented at the platoon and company level. Course covers in-depth analysis of the principles of war related to offensive and defensive operations.

134A. Military Organizational Leadership Skills (1/2) I.

Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. Students develop interpersonal and management skills by practical application of leadership of military organizations in a supervised leadership laboratory. Advanced-level military skills presented. Students fulfill the roles of senior non-commissioned officers. (P/NP grading only.)

134B. Military Organizational Leadership Skills (1/2) II.

Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. As more complex material is presented in classroom, the laboratory environment becomes more challenging. Students serve as senior non-commissioned officers in squad, platoon and company levels, given appropriate authority and responsibility. (P/NP grading only.)

134C. Military Organizational Leadership Skills (1/2) III.

Laboratory—2 hours. Prerequisite: upper division status; courses 24A-24B-24C or consent of instructor. Students prepared for advanced summer training experience by extensive requirements to plan, organize and conduct military operations in field environments; individual leadership potential is closely assessed in the laboratory environment.

141. U.S. Army Management Systems (2) III.

Lecture—2 hours. Prerequisite: upper division status and course 131. Army decision making, personnel and equipment management. Includes command and staff functions, training, intelligence gathering, techniques for the conduct of meetings, and logistics management procedures at unit level.

142. Military Law (2) II.

Lecture—2 hours. Prerequisite: upper division status and course 141. Analysis of the American Military Justice System, the Uniform Code of Military Justice, the Hague and Geneva Conventions, and customary law of war. Includes detailed study of selected procedures of military justice system.

143. Military Ethics and Professionalism (2) I.

Lecture—2 hours. Prerequisite: upper division status and course 142. Profession of arms, its characteristics, uniqueness, roles, and responsibilities. Discussion topics include the professional soldier's responsibilities to the Army and the Nation, and the need for ethical conduct. Case studies used to develop ethical decision making skills.

144A. Military Training Leadership Skills (1/2) I.

Laboratory—2 hours. Prerequisite: upper division status; courses 134A, 134B, 134C, and 141. Develops and exercises

the leadership skills necessary to plan, coordinate and conduct a training program through practical application under supervision. Emphasis on analysis of objectives, instructor planning, media utilization and evaluation of learning. Students perform as cadet officers. (P/NP grading only.)

144B. Military Training Leadership Skills (1/2) II.

Laboratory—2 hours. Prerequisite: upper division status; courses 134A, 134B, 134C, and 141. Requirements for training of all other levels of the cadet corps are given to students for conduct in laboratory environment (under supervision). Students placed in realistic role of junior officer with appropriate level of responsibility. Students perform as cadet staff officers. (P/NP grading only.)

144C. Military Training Leadership Skills (1/2) III.

Laboratory—2 hours. Prerequisite: upper division status; courses 134A, 134B, and 134C. Final laboratory in military science sequence; students are prepared for final testing and certification prior to commissioning as officers. Students will demonstrate all leadership skills necessary to commissioned officers. Students perform leadership tasks at platoon, company and battalion levels. (P/NP grading only.)

Aerospace Studies (Air Force)

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. 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. Due to firm scheduling requirements for the AFROTC program, students are encouraged to work closely with their academic advisers in planning this academic program.

later than the middle of a student's sophomore year. Contact representatives in the Aerospace Studies Department at CSUS, telephone (916) 278-7315, for information on the program or processing of entry. (An AFROTC Program is also available within the UC system at Berkeley campus, Department of Aerospace Studies, (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.

Music

(College of Letters and Science)

D. Kern Holoman, Ph.D., Chairperson of the Department

Department Office, 112 Music Building
(752-0666)

Faculty

Lawrence E. Anderson, Ph.D., Lecturer
 4Robert S. Bloch, M.A., Professor
 Sydney R. Charles, Ph.D., Professor Emeritus
 Donna M. DiGrazia, Ph.D. cand., Lecturer
 Andrew D. Frank, M.A., Professor
 Michele Y. Fromson, Ph.D. cand., Lecturer
 D. Kern Holoman, Ph.D., Professor
 Mary E. Lust, B.A., Lecturer
 3Albert J. McNeil, M.S., Professor

David A. Nutter, Ph.D., Associate Professor
 Christopher A. Reynolds, Ph.D., Associate Professor
 Jerome W. Rosen, M.A., Professor Emeritus
 Wayne Slawson, Ph.D., Professor
 Richard G. Swift, M.A., Professor
 William E. Valente, M.A., Professor

Faculty Affiliates in Applied Music

Dona Lee Brandon, M.S.M., Lecturer (*organ*)
 Lois Brandwynne, M.A., Lecturer (*piano*)
 Diana Dallman, M.M., Lecturer (*viola da gamba*)
 Thomas Derthick, B.M., Lecturer (*string bass*)
 Joel Elias, M.M., Lecturer (*trombone*)
 Emily Ferguson, M.M., Lecturer (*oboe*)
 Stephanie Friedman, M.A., Lecturer (*voice*)
 Elizabeth Gibson, M.M., Lecturer (*violin, viola*)
 David Granger, M.M., Lecturer (*bassoon*)
 Edward Higgins, M.M., Lecturer (*trumpet*)
 Kurt Kaufman, B.M., Lecturer (*cello*)
 Stanley Lunetta, M.A., Lecturer (*percussion*)
 Deborah Pittman, M.A., Lecturer (*clarinet*)
 Robin Richman, B.M., Lecturer (*flute*)
 Alicia Telford, B.M., Lecturer (*French horn*)

The Robert Bloch String Quartet of UC Davis

Robert S. Bloch, violin
 Elizabeth Gibson, violin
 David George, viola
 Kurt Kaufman, cello

The UCD Faculty Woodwind Quintet

Robin Richman, flute
 Emily Ferguson, oboe
 Deborah Pittman, clarinet
 David Granger, bassoon
 Alicia Telford, French horn

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, music history or conducting, 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
Piano skills, Music P (required of all majors)	0
Depth Subject Matter	38
Music 104A, 104B, 104C	12
At least 12 units selected from Music 121, 122, 190	12
At least 6 units selected from Music 107A, 107B, 107C, 108A, 108B, 111, 112, 113A, 113B, 198, 199	6
At least 8 units in performance courses	8
Select from Music 130 or 131, 141, 142, 143, 144, 145, 146.	
Total Units for the Major	92

Beginning and transfer students must take an examination in piano playing. Sufficient pianistic ability to perform four-part chorales and compositions comparable in difficulty with *The Little Preludes* of Bach is prerequisite to upper division courses in the major. Students with deficiencies will be required

to pass Music 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. Undergraduates contemplating advanced study in music should prepare to satisfy these requirements as they proceed to the bachelor's degree.

Major Advisers. A. D. Frank, W. E. Valente.

Minor Program Requirements:

UNITS
Music

A minimum of eighteen units of upper division
 Music courses

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, L. E. Anderson. See also the section on 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

P. Rudimentary Piano (0) I, II, III. The Staff Laboratory—1 hour. Prerequisite: Music majors and minors enrolled in course 4 (concurrently). Designed to train students to meet the minimal piano requirements for the major or minor in music. (P/NP grading upon completion of term.)

1. Basic Musicianship (3) 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, Slawson; II, Lust; III, Lust 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. General Education credit for two-course sequence of non-GE courses (3A-3B) which will satisfy requirement for one course: Civilization and Culture/Introductory.

3B. Introduction to Music Theory (4) I, Lust; II, Slawson; III, Lust Lecture—3 hours; laboratory—1 hour. Prerequisite: course 3A. Continuation of course 3A. Intended for the general student. General Education credit for two-course sequence of non-GE courses (3A-3B) which will satisfy requirement for one course: Civilization and Culture/Introductory.

4A-4B-4C. Elementary Theory (5-5-5) I, II, III. Frank Lecture—5 hours. Development of writing and listening techniques through the study of music fundamentals; ear-training, beginning tonal counterpoint and harmony; keyboard harmony; score reading; analysis of repertory. Intended primarily for music majors and minors.

5A-5B-5C. Intermediate Theory (4-4-4) I, II, III. Valente Lecture—4 hours. Prerequisite: course 4C. Intermediate tonal counterpoint and harmony.

10. Introduction to Musical Literature (4) I, Frank, Fromson, —; II, Bloch, Fromson, —; III, Fromson, —

Lecture—3 hours; listening section—1 hour. An introduction to composers and major styles of Western music. Lectures, listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture/Introductory.

24A. Introduction to the History of Music, I (4) I, Holoman Lecture—3 hours; listening section—1 hour. Prerequisite: course 4A or 3A (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: course 24A; course 4B or 3B (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: course 4B or 3B; 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, II, III. Fromson 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. Fromson 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 composers and musical styles from around 1400 to around 1600.

25C. Introduction to the History of Music, VI (4) III. Fromson 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 from around 1590 to around 1680.

***28. Introduction to Afro-American Music** (4) III. McNeil Lecture—3 hours; listening and discussion—1 hour. A study of the Afro-American rhythm, field hollers, work song, spirituals, blues, gospel, and jazz; the contrast between West African, Afro-Caribbean, and Afro-Cuban musical traditions.

30A-U. Applied Study of Music: Intermediate (1) I, II, III. The Staff

Performance instruction—1 hour. Prerequisite: open to Music majors with ability to perform scales and short compositions from standard repertory; admission by audition and consent of instructor. Class instruction, arranged by section: (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit. Offered as demand indicates.

31A-U. Applied Study of Music: Intermediate (Individual) Performance Instruction (2) I, II, III. The Staff Performance instruction—½ hour; practice—5 hours. Prerequisite: open to Music majors only; admission by audition and consent of instructor. Individual instruction in (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit.

41. University Symphony (2) I, II, III. Holoman Rehearsal—4 hours. Prerequisite: admission subject to audition before the first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal, and performance of music from the orchestral literature. May be repeated for credit. (P/NP grading only.)

42. University Chamber Singers (2) I, McNeil; II, III. Di Grazia 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, McNeil; II, Di Grazia; III, McNeil Rehearsal—4½ hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the

University. Rehearsal and performance of choral music. May be repeated for credit. (P/NP grading only.)

45. Early Music Ensemble (2) I, II, III. Nutter
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance and Baroque music for vocal ensemble and historical instruments. May be repeated for credit. (P/NP grading only.)

46. Chamber Music Ensemble (1) I, II, III. The Staff (Granger in charge)
Rehearsal—2 hours; student practice—1 hour. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Study, rehearsal, and performance of ensemble music for strings, winds, voice, piano, harpsichord, and organ. May be repeated for credit. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

104A-104B-104C. Advanced Theory (4-4-4) I-II-III. Swift
Lecture—4 hours. Prerequisite: course 5C. Twentieth-century compositional procedures: analyses and projects in corn position.

107A. Computer and Electronic Music (3) I. Slawson
Lecture—3 hours; laboratory—1 hour. Prerequisite: consent of instructor. Studies in electronic and computer music composition. The principles and procedures of composition in various electronic media are explored through compositional exercises. (Limited enrollment.)

107B. Computer and Electronic Music (3) II. Slawson
Lecture—3 hours; laboratory—1 hour. Prerequisite: course 107A and consent of instructor. Continuation of course 107A. (Limited enrollment.)

107C. Computer and Electronic Music (3) III. Slawson
Lecture—3 hours; laboratory—1 hour. Prerequisite: course 107B and consent of instructor. Continuation of course 107B. (Limited enrollment.)

108A-108B. Orchestration (2-2) I, II. The Staff
Lecture—2 hours. Prerequisite: course 5C. Techniques of orchestration from study of basic instrumental techniques to analysis of orchestral scores and scoring for various instrumental combinations.

109. Masterworks in Performance (2) I. Holoman
Lecture—2 hours. Prerequisite: course 10 recommended. Thorough score study of a single masterwork to be performed on campus during the quarter. Guided listening, selected readings, analysis and study of composer's milieu. Recommended especially for members of the performing ensembles scheduled to present the work.

110A. The Music of a Major Composer: Beethoven (4) II. Di Grazia
Lecture—3 hours; listening section—1 hour. Work of Beethoven studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 3A-3B or 10.

***110B. The Music of a Major Composer: Stravinsky (4) III.** Frank
Lecture—3 hours; listening section—1 hour. Work of Stravinsky will be studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 3A-3B or 10.

110C. The Music of a Major Composer: Bach (4) I. Bloch
Lecture—3 hours; listening section—1 hour. Work of Bach studied in the context of his time and his contemporaries. Lectures, listening sections, and selected readings. For non-majors. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 3A-3B or 10.

110D. The Music of a Major Composer: Mozart (4) III. Frank
Lecture—3 hours; listening section—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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 3A-3B or 10.

111. Choral Conducting (2) I. McNeil
Lecture—2 hours. Prerequisite: course 5C. Study of the principles and techniques of conducting choral ensembles.

***112. Instrumental Conducting (2) II.** Holoman
Lecture—2 hours. Prerequisite: course 5C. Principles and techniques of conducting instrumental ensembles.

***113A. Music of Non-Western Civilizations (2) I.**
Lecture—2 hours; listening section—1 hour. Prerequisite: course 25A. 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. 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) II. Nutter; III. The Staff
Seminar—4 hours (includes selected listening). Prerequisite: courses 5C and 25C. Sources and problems of a historical period or musical style selected by the instructor and announced in advance. May be repeated for credit.

122. Topics in Analysis and Theory (4) I. Swift; II, Bloch; III, Slawson
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.

129. World Music (4) III. McNeil
Lecture—3 hours; listening—1 hour; selected readings. Prerequisite: course 3A-3B or 10 recommended. Intended for non-majors. Studies in selected areas of non-western music, including appropriate instrumental and performing techniques, analysis of tonal systems, melody, rhythm and musical structures. Emphasis placed on cultural context of the music. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: course 3A-3B or 10.

130A-U. Applied Study of Music: Advanced (1) I, II, III. The Staff
Performance—1 hour. Prerequisite: open to Music majors with ability to perform scales and short compositions from standard repertoire; admission by audition and consent of instructor. Class instruction, arranged by section: (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit. Offered as demand indicates.

131A-U. Applied Study of Music: Advanced (Individual) (2) I, II, III. The Staff
Performance—½ hour; practice—5 hours. Prerequisite: open to Music majors only; admission by audition and consent of instructor. Individual instruction in (A) Voice (prerequisite of course 1 or the equivalent); (B) Piano; (C) Harpsichord; (D) Organ; (E) Violin; (F) Viola; (G) Cello; (H) Double Bass; (I) Flute; (J) Oboe; (K) Clarinet; (L) Bassoon; (M) French Horn; (N) Trumpet; (O) Trombone; (P) Tuba; (Q) Percussion; (R) Classical Guitar; (S) Lute; (T) Viola da gamba; (U) Recorder. May be repeated for credit.

141. University Symphony (2) I, II, III. Holoman
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University whose proficiency meets the requirements of concert performance. Sight-reading, rehearsal and performance of music from the orchestral literature. May be repeated for credit. (P/NP grading only.)

142. University Chamber Singers (2) I. McNeil; II, III. Di Grazia
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. McNeil; II, Di Grazia; III, McNeil
Rehearsal—4½ hours. Prerequisite: admission subject to audition before first class meeting. Open to any student in the University. Rehearsal and performance of choral music. May be repeated for credit. (P/NP grading only.)

145. Early Music Ensemble (2) I, II, III. Nutter
Rehearsal—4 hours. Prerequisite: admission subject to audition before first class meeting. Rehearsal and performance of Medieval, Renaissance and Baroque music for vocal ensemble and historical instruments. May be repeated for credit. (P/NP grading only.)

146. Chamber Music Ensemble (1) I, II, III. The Staff (Granger 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, re-

hearsal, 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 (Bloch in charge)
Lecture—4 hours. Prerequisite: courses 5C and 25C, and consent of instructor; course 104C recommended. Intended primarily for majors in music intending to apply for graduate programs in music history, composition, or theory. Review of musical skills, issues in theory and analysis, and the history and literature of music.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

200. Music Research (4) I. Nutter
Seminar—3 hours; term paper. Introduction to problems and techniques of research; practical application of music bibliography to questions about significant issues in musicology, music theory, and performance practice.

201. Advanced Music Research and Criticism (4) II. Swift
Seminar—3 hours; term paper. Study and practice of expository writing about music. Application of advanced research techniques in writing for different purposes, ranging from essays for the general public to thesis proposals and articles for scholarly journals.

202. Notation (4) III. Nutter
Seminar—3 hours; term paper. Study of musical notation; investigation of techniques for editing Medieval and Renaissance music.

203A-203B-203C. Composition (4-4-4) A: I. Swift in charge; II, Frank in charge; III, the Staff
Seminar—3 hours. Technical projects and free composition.

204. Advanced Conducting (3) I, II, III. The Staff (Holoman in charge)

Tutorial—2 hours; practicum—2 hours. Prerequisite: courses 111, 112 or equivalent; keyboard skills appropriate to graduate standing. Technical aspects of conducting and the broader issues in music history and analysis that conductors must face before leading a rehearsal or performance.

207. Advanced Electronic and Computer Music (4) II. Slawson
Seminar—2 hours; plus individual student/instructor meeting—2 hours. Prerequisite: courses 107A-107B-107C. Advanced composition of computer and electronic music with the Sun 3-based computer-music system and associated facilities.

221. Topics in Music History (4) II. Nutter; III, The Staff
Seminar—3 hours. Studies in selected areas of music history and theory. May be repeated for credit.

222. Techniques of Analysis (4) I. Swift; II, Bloch; III, Slawson
Seminar—3 hours. Analysis and analytical techniques as applied to music of all historical style periods. May be repeated for credit.

299. Individual Study (1-12) I, II, III. The Staff (Holoman in charge)
(S/U grading only.)

Teaching Methods Courses

300. The Teaching of Music (3) II. Anderson
Lecture—3 hours. Prerequisite: course 1 or the equivalent. Methods of teaching music in grades K-6.

***301. The Teaching of Music (3) I.** McNeil
Lecture—3 hours. Prerequisite: course 5C (or the equivalent). Methods of teaching music in grades 7-12.

Instrumental Methods. The courses in this series consider methods of teaching orchestra and band instruments, and include repertoire and program planning for secondary schools.

321A-321B. Stringed Instruments (1-1) I-II. The Staff
Discussion—2 hours. Prerequisite: course 4C.

322. Brass Instruments (1) III. 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.

***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	3-4
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 141A or 141C	4
One course from Anthropology 141B, 144, History 162, 166A, 166B, 169A, 169B	4
Areas of Specialization	20
(a) Art area:	
Native American Studies 101, Art 151, 183C, 183E	4
(b) Education area:	
Native American Studies 171, Applied Behavioral Sciences 173 or 175, Education 100, 110, 163	4
(c) Community Development area:	
Applied Behavioral Sciences 151, 152, Anthropology 122, 126, Political Science 178 or Applied Behavioral Sciences 154	4
(d) Ethnicity area:	
Applied Behavioral Sciences 172, 176, Anthropology 134, Political Science 126, Sociology 130	4
(Other areas may be developed by the student in consultation with the major adviser)	

†Students may substitute other Native American Studies courses with the approval of the Native American Studies Major Review Committee.

Unrestricted Electives	42-43
Total Units for the Major	180

Major Adviser. D. Rising.

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	1
Ethnohistory, Native American Studies 130A, 130B or 130C	1
Philosophy and values, Native American Studies 156 or 157	1
Politics and current affairs, Native American Studies 116, 117, 118, 124 or 161	1
Literature, Native American Studies 181A, 181B or 181C	1
Art, Native American Studies 101	1

Related Undergraduate Major. Concentration in Native American Studies is also available through the Applied Behavioral 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 under University requirements.)

Courses in Native American Studies

Lower Division Courses

1. Introduction to Native American Studies (4) I, II, III. Rising Lecture—3 hours; discussion—1 hour. Introduction to U.S. Indian tribal-reservation culture; relationships of Native American Studies to other academic disciplines.

10. Native American Experience (4) I, III. The Staff Lecture—4 hours. Introduction to American-Indian historical and socio-cultural development with emphasis upon the U.S. area and upon those processes such as relations with non-Indians which have contributed to the current condition of Indian people. General Education credit: Contemporary Societies/Introductory.

32. Native American Music and Dance (4) I, Rising 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) II. The Staff 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. The Staff 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 (Rising 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) I.** The Staff 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.** Rising 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) II. Rising 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) III. Rising 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.** Rising 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 or 10; History 17A 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) III. Forbes Lecture—4 hours. Prerequisite: course 1; History 17A-17B recommended. Study of Native-American Ethno-History in North America after 1890. General Education credit: Contemporary Societies/Non-introductory. Recommended GE prerequisite: History 17A, 17B, or Native American Studies 10. Offered in odd-numbered years.

156. Native American Ethics and Value Systems (4) I. The Staff 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) II. The Staff 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. The Staff Lecture—4 hours. Prerequisite: course 1; Applied Behavioral Sciences 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. The Staff 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. The Staff 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.

181A-181B-181C. Native American Literature (4-4-4) I-II-III. The Staff
 Lecture—4 hours. Prerequisite: English 3, Comparative Literature 1, 2, 3, or any course from the General Education Literature Prerequisite List. Analysis of works by or about Native Americans including novels and autobiographies, analysis of Native-American poetry, oral literature, songs, and tales. (A), the novel and fiction; (B), nonfiction works by native authors; (C), traditional literature and poetry. Offered in even-numbered years. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List.

***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.)

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.

199. Special Study for Advanced Undergraduates (1-5) I, II, III, summer. The Staff (Chairperson in charge)
 Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

***220. Principles and Techniques of Nematode Taxonomy and Morphology (4) III.** The Staff
 Lecture—2 hours; laboratory—6 hours. Prerequisite: course 100. Analysis and evaluation of the techniques used in the collection, extraction, and preparation of specimens, free-hand and histologic sections; presentation of illustrative material. Offered in odd-numbered years.

222. Advanced Plant Nematology (3) II. Ferris, Jaffee
 Lecture—2 hours; laboratory—3 hours. Prerequisite: course 100 or the equivalent. Review and investigation of relationship between parasitic nematodes and plants, the relationship between nematodes and their environment, and relationship between nematodes and other biota. Biology of systems explored at the population, organism, and cellular levels. 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. Biological Control in Insect and Plant Nematology (2) I, Jaffee, Kaya
 Lecture—1 hour; laboratory—3 hours or field trips. Prerequisite: upper-division course in entomology, nematology, or plant pathology. Biological control potential of nematodes against insect pests and of microorganisms against nematode pests. Offered in odd-numbered years.

245. Field Nematology (1) I. The Staff
 Fieldwork—6 days. Prerequisite: courses 100, 222. Six-day demonstration and field study in applied nematology including diagnosis and prediction of nematode field problem strategies for control field plot design, and establishment in association with diverse California crops. (S/U grading only.)

290. Seminar (1) I, II, III. The Staff (Chairperson in charge)
 Seminar—1 hour. (S/U grading only.)

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.)

Nematology

(College of Agricultural and Environmental Sciences)

Howard Ferris, Ph.D., Chairperson of the Department

Department Office, 488 Hutchison Hall (752-1403)

Faculty

- Howard Ferris, Ph.D., Professor
- Renaud Fortuner, Ph.D., Lecturer
- Bruce A. Jaffee, Ph.D., Assistant Professor
- Harry K. Kaya, Ph.D., Professor
- Benjamin F. Lownsbery, Ph.D., Professor Emeritus
- Armand R. Maggenti, Ph.D., Professor
- Dewey J. Raski, Ph.D., Professor Emeritus
- David R. Viglierchio, Ph.D., Lecturer
- Becky B. Westerdahl, Ph.D., Lecturer
- Valerie M. Williamson, Ph.D., Assistant Professor

Related Major Program. See the major in Entomology.

Graduate Study. Graduate degrees specializing in Nematology are offered through the Department of Entomology or the Department of Plant Pathology. Refer to the Graduate Division section in this catalog for details.

Courses in Nematology

Upper Division Courses

100. General Plant Nematology (4) I. The Staff
 Lecture—2 hours; laboratory—6 hours. Prerequisite: Biological Sciences 1 or 10; lower division students with consent

Neurology

See Medicine, School of

Neurosurgery

See Medicine, School of

Nutrition

See Nutrition, below; Nutrition (A Graduate Group); and Nutrition Science

Nutrition

(College of Agricultural and Environmental Sciences)

Barbara O. Schneeman, Ph.D., Chairperson of the Department

Department Office, 3135 Food and Agricultural Sciences Building (752-4630)

Faculty

- Andrew J. Clifford, Ph.D., Professor
- Kathryn G. Dewey, Ph.D., Associate Professor
- Louis E. Grivetti, Ph.D., Professor (Nutrition, Geography)
- Eunice Gwynn, Ph.D., Lecturer
- Fredric W. Hill, Ph.D., Professor
- Lucille S. Hurley, Ph.D., Professor (Nutrition, Internal Medicine)
- Carl L. Keen, Ph.D., Associate Professor (Nutrition, Internal Medicine)
- Bo L. Lonnerdal, Ph.D., Professor (Nutrition, Internal Medicine)
- Jo Ann Prophet, M.S., Lecturer S.O.E.
- Ann Reisenauer, Ph.D., Lecturer
- Robert B. Rucker, Ph.D., Professor (Nutrition, Biological Chemistry)
- Carolyn Russ, M.S., Lecturer
- Barbara O. Schneeman, Ph.D., Professor (Nutrition, Food Science and Technology, Internal Medicine)
- Judith S. Stern, Sc.D., Professor (Nutrition, Internal Medicine)
- Helene Swenerton, Ph.D., Lecturer
- Frances J. Zeman, Ph.D., Professor

Related Major Programs. See the majors in Community Nutrition, Dietetics, and Nutrition Science.

Minor Program Requirements:

The Department of Nutrition offers four minor programs open to students majoring in other disciplines who wish to complement their study programs with a concentration in the area of food and nutrition.

Note: If the student's major program requires the same course in biochemistry and physiology, only one of the courses may duplicate credit toward the minor. Each program below lists replacement courses to fulfill the minimum unit requirement.

	UNITS
Community Nutrition	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 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 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

NOTE: For key to footnote symbols, see page 131.

Physiology 110	5
Nutrition 110, 111	9
Replacement courses (see note above): Nutrition	
114, 115, 116A-116B, 117, 120, 122, 122L,	
123, 124, 201, 204.	

Minor Adviser. R.B. Rucker.

Graduate Study. Programs of study leading to the M.S. and Ph.D. degrees are available in Nutrition. For information on graduate study contact the graduate adviser.

Courses in Nutrition

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. General Education credit with concurrent enrollment in course 11; Nature and Environment/Introductory.

11. Current Topics and Controversies in Nutrition (2) II, III. Hill

Discussion—1½ hours; oral reports, written reports, term paper. Prerequisite: course 10 (may be taken concurrently). Assigned readings and discussion of topics of current concern and broad interest in contemporary nutrition. Coordinated with course 10. Not open for credit to students who have taken an upper division course in nutrition. General Education credit with concurrent enrollment in course 10; Nature and Environment/Introductory.

20. Food and Culture: An Introduction to Culture, Diet, and Cuisine (4) II. Grivetti

Lecture—3 hours; discussion—1 hour. Prerequisite: Anthropology 2, Geography 2, and course 10 recommended. Historical and contemporary overview of culture, food habits, and diet; exploration of the major themes in food habit research; minority food habits; origins and development of dietary practices. (Same course as Food Science and Technology 20.)

93. Public Issues in Nutrition and Food Science (1) II. Schneeman, 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. (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.

110. Principles of Nutrition (5) II. Calvert (Animal Science) and Rucker (Nutrition); III, Hung (Animal Science) and Rucker (Nutrition)

Lecture—5 hours. Prerequisite: Physiological Sciences 101B (preferred) or Biochemistry 101B (may be taken concurrently); 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. 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.

112. Nutritional Assessment: Dietary, Anthropometric, and Clinical Measures (2) III. Dewey

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 101 or 111 (may be taken concurrently). Methods of nutritional assessment in humans to evaluate dietary intake (dietary records and recalls, food frequency lists), body composition (anthropometry, physiological methods), and clinical signs of malnutrition. Principles of validity and reliability and interpretation of results.

113. Nutritional Assessment: Biochemical Measures (2) I, II. The Staff (Clifford in charge)

Lecture—1 hour; laboratory—2 hours. Prerequisite: course 111. Variety of biologic markers of human nutritional status including hematological, urine, and hair analyses of clinical importance will be demonstrated and evaluated. Emphasizes

the precision, accuracy, reliability and interpretation of the values.

114. Developmental Nutrition (4) II. Keen
Lecture—4 hours. Prerequisite: course 110 or 101; course 111. Role of nutritional factors in embryonic and postnatal development.

115. Animal Feeding (4) II. Brown (Animal Science)
Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 8B, Animal Science 41. Influences of production, processing and storage methods on the nutritive value of feed-stuffs; analyze and evaluate feeds; and formulate diets for farm livestock.

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—1 hour; laboratory—1 hour; 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
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
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) I. 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.

122. Ruminant Nutrition and Digestive Physiology (3) III. Morris and Macy (Animal Science)
Lecture—3 hours. Prerequisite: Physiology 110; Biochemistry 101A-101B or Physiological Sciences 101A-101B; Microbiology 2 recommended. Study of nutrient utilization as influenced by the unique aspects of digestion and fermentation in the ruminant.

122L. Ruminant Nutrition Laboratory (2) III. Macy (Animal Science)
Laboratory—6 hours. Prerequisite: course 122 (concurrently). Students will conduct experiments in small groups and attend demonstrations on topics peculiar to ruminant digestive physiology and nutrition. The laboratory will deal with topics developed in lectures.

123. Nutrition of Non-Ruminant Animals (3) III. Klasing (Avian Sciences)
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110 or 111. Physiological Sciences 101A-101B or Biochemistry 101A-101B; upper division standing in biological or agricultural sciences recommended. Comparative nutrition of non-ruminant animals including domestic animals, wildlife and man. Relation of nutrition to body composition, feed intake, growth, disease, exercise and stress. Discussion and laboratory exercises on the scientific method for answering questions in nutrition.

124. Nutrition and Feeding of Finfishes and Shellfishes (3) III. Hung (Animal Science)
Lecture—3 hours. Prerequisite: course 110 or 115. Application of principles of nutrition to feeding of finfishes and shellfishes; feeding habits, gastrointestinal anatomy, digestive physiology, aquatic environment, nutrient requirements, diet formulation and quality control, and feeding practices of commercially cultured fishes.

129. Journalistic Practicum in Nutrition (2) III. Stern, Swenerton

Discussion—2 hours. Prerequisite: course 111; a course in written or oral expression or consent of instructor. Critical analysis and discussion of current, controversial issues in nutrition; the use of journalistic techniques to interpret scientific findings for the lay public. Students will be required to write several articles for campus media. Course may be repeated once for credit. Offered in even-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.)

190C. Nutrition Research Conference (1) I, II, III. The Staff (Schneeman in charge)
Discussion—1 hour. Prerequisite: upper division standing in Nutrition or related biological science; consent of instructor. Introduction to research findings and methods in nutrition. Presentation and discussion of research by faculty and students. May be repeated for credit. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff
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 Science, 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 (Schneeman in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Schneeman in charge)
(P/NP grading only.)

Graduate Courses

201. Vitamin Metabolism (2) II. Rucker
Lecture—2 hours. Prerequisite: course 110, Microbiology 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 metabolism and chemistry of vitamins and vitamin-like compounds emphasized.

202. Advanced Animal Energetics and Energy Metabolism (4) I. 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, Microbiology 2, Biochemistry 101B or 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, Keen
Lecture—2 hours. Prerequisite: course 110, Microbiology 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.** The Staff (Zeman in charge)
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 world-wide, with emphasis on maternal and child health; efficacy of nutrition interventions and food aid; consideration of the complex relationships between economic development, poverty and nutrition, and options for nutrition policy and planning. Offered in even-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 (Nutrition)

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.

257. Selected Topics in Nutritional and Hormonal Control of Nitrogen Metabolism (2) I, Calvert (Animal Science)

Lecture—2 hours. Prerequisite: courses 201 through 204; Physiological Sciences 205A-205B or the equivalent. Quantitative and qualitative aspects of nitrogen metabolism; critical evaluation of dietary intake, hormones and diet-hormone interactions which affect nitrogen metabolism, including protein synthesis-degradation, amino acid synthesis-catabolism, nitrogen transport-excretion, depending on current literature. Offered in odd-numbered years.

290. Beginning Nutrition Seminar (1) I, II. Grivetti (Nutrition) in charge

Seminar—One 2-hour session. Prerequisite: first-year graduate standing. Discussion and critical evaluation of topics in nutrition with emphasis on literature review and evaluation in this field.

290C. Research Conference (1) I, II, III. The Staff (Schneeman 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. The Staff (Schneeman 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 (Schneeman in charge)

299. Research (1-12) I, II, III. The Staff (Schneeman in charge) (S/U grading only.)

Professional Course

380. Supervised Teaching in Dietetics (2-12) I, II, III, extra-session summer. The Staff

Laboratory—6-36 hours. Prerequisite: graduate standing in M.S. program in Nutrition with emphasis in dietetics; consent of instructor. Directed teaching in approved dietetic internships or coordinated program in dietetics. May be repeated for a total of 12 units; 3 units may be counted toward degree credit.

Nutrition (A Graduate Group)

R.L. Baldwin, Ph.D., Chairperson of the Group

Group Office, 1151 Food and Agricultural Sciences Building (752-2512)

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.

Nutrition 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
Mathematics, (Mathematics 16A-16B)	6
Biology with laboratory (Biological Sciences 1)	5
Chemistry, general organic, and quantitative (Chemistry 1A-1B-1C, 5; and 8A-8B or 128A-128B and 129A)	25-27

†To fulfill the academic requirements for an internship in Dietetics, choose the following courses from the categories in which they appear above: English 1 or 3, Psychology 1, Sociology 1 or 3 or Anthropology 2, Economics 1A or 1B, Food Science and Technology 100A, 100B, 101A, 101B, Nutrition 110, 111, 116A, 116B (116AL-BL recommended). The following courses must be added: Agricultural Economics 112; Food Service Management 120, 120L, 121, 122, 123; Applied Behavioral Sciences 173 or Education 110 or 111. Students intending to apply for admission to a dietetic internship should contact the Advising Office no later than the first quarter of the junior year for information on procedures.

Microbiology with laboratory (Microbiology 2, 3)	4
Statistics (Statistics 13 or Agricultural Science and Management 150)	4
Written or oral expression (see College requirement)	7-8
Computer logic or programming (Computer Science Engineering 10 or Agricultural Science Management 21)	3
Physics (Physics 1A-1B)	6

Depth Subject Matter

Biochemistry (Biochemistry 101A-101B or Physiological Science 101A-101B)	6-7
Nutrition 110, 111, 117	14
Nutrition courses selected from 112, 113, 114, 115, 116A, 116B, 122, 122L, 123, 190, 190C, 198, and 199	6-8

Breadth Subject Matter

Courses in social sciences and humanities.

Restricted Electives

Biochemistry laboratory (Biochemistry 101L)	6
Food science	6
Physiology with laboratory (Physiology 110, 110L, plus an additional physiology course) ...	10
Additional nutrition or related biological and physical sciences	20

Unrestricted Electives

Total Units for the Major · 180

Major Adviser. B. L. Lonnerdal.

Advising Center for the major is located in 1151 Food and Agricultural Sciences Building (752-2512).

Graduate Study. The Department of Nutrition offers programs of study and research leading to the M.S. and Ph.D. degrees in Nutrition. For information on graduate study contact the graduate adviser. See also the Graduate Division section in this catalog.

Graduate Adviser. See *Class Schedule and Room Directory*.

Obstetrics and Gynecology

See Medicine, School of

Ophthalmology

See Medicine, School of

Oriental Languages

See Chinese and Japanese

Orientation

(College of Agricultural and Environmental Sciences)

Courses in Orientation

Questions pertaining to the following course should be directed to the instructor or to the Biochemistry and Biophysics Department, 149 Briggs Hall.

Lower Division Course

1. **Orientation (no credit)** I, II, III. Chaykin (Biochemistry and Biophysics)

Discussion. Exploration of the philosophy, purposes, significance, expectations and mechanisms of university education. (P/NP grading only.)

Orthopaedic Surgery

See Medicine, School of

Otolaryngology

See Medicine, School of

Pathology

See Pathology (Medicine, School of); and Pathology (Veterinary Medicine), below

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

Mark L. Anderson, D.V.M., Ph.D., Assistant
Adjunct Professor (*California Veterinary
Diagnostic Laboratory*)
Bradd C. Barr, D.V.M., Ph.D., Assistant Adjunct
Professor (*California Veterinary Diagnostic
Laboratory*)
Arthur A. Bickford, V.M.D., Ph.D., Adjunct
Professor (*California Veterinary Diagnostic
Laboratory*)
Patricia C. Blanchard, D.V.M., Ph.D., Assistant
Adjunct Professor (*California Veterinary
Diagnostic Laboratory*)
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., Associate
Professor
N. James MacLachlan, B.V.Sc., Ph.D., Associate
Professor
F. Charles Mohr, D.V.M., Ph.D., Assistant
Professor
Peter F. Moore, B.V.Sc., Ph.D., Associate
Professor
Jack E. Moulton, D.V.M., Ph.D., Professor
Emeritus
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. **Foreign Animal Diseases** (3) III. Olander
Lecture—3 hours. Prerequisite: course 210, Veterinary Medicine 452, and 451 or 453. Designed for students interested in research and teaching in tropical veterinary medicine. Diseases studied are the most important ones that currently ravage Third-World countries, particularly in Africa and Latin America. (S/U grading only.) Offered in even-numbered years.

282. **Tumor Pathology** (3) II. The Staff (Dungworth in charge)
Lecture—3 hours. Prerequisite: graduate standing or final year veterinary student and consent of instructor. The histogenesis, incidence, geographical distribution, etiology, transmission, immunity, host response, gross and microscopic structure, and metastasis of the neoplasms of domestic animals. Offered in even-numbered years.

286A-286B-286C. **Selected Topics in Advanced Special Pathology** (3-4-4) I-II-III. The Staff (Dungworth in charge)
Lecture—3-4-4 hours. Prerequisite: graduate standing, D.V.M. degree, or final-year veterinary medical student. Patterns of reaction to injury of selected organ systems and differentiating morphologic characteristics of their major disease entities. Emphasis on pathogenetic mechanisms and cellular/subcellular pathology involved in inflammation, pulmonary disease, renal disease, and avian disease. Offered beginning fall quarter of odd-numbered years.

287. **Comparative Pathology of Laboratory Animals** (3) III. Lowenstine
Lecture—3 hours. Prerequisite: graduate standing, DVM degree, or final year veterinary student; consent of instructor in charge. The pathology of diseases of animals commonly kept in laboratory settings including cold-blooded vertebrates as well as rodents, lagomorphs and non-human primates. Emphases will be recognition of lesions and understanding of pathogenesis. Offered in even-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 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. The Staff (Pool in charge)
Discussion—1 hour. Prerequisite: graduate standing or final-year veterinary student; consent of instructor. Diagnosis and discussion of current surgical pathology cases based on clinical records and microscopic study. (S/U grading only.)

293. **Necropsy and Surgical Pathology** (1-4) I, II, III. The Staff (Olander in charge)
Discussion—1 hour; laboratory—32 hours. Prerequisite: graduate standing; consent of instructor. Responsible diagnostic casework. Performance of necropsies, slide reading, and case reporting. (S/U grading only.)

294. **Primate Pathology Conference** (1) I, II, III. Lowenstine
Discussion—1 hour. Prerequisite: graduate standing or final-year veterinary student; consent of instructor. Discussion of selected topics in primate pathology based on currently available material. Given jointly by Departments of Pathology in the Medical and Veterinary Schools, and the California Primate Research Center. (S/U grading only.)

298. **Group Study** (1-5) I, II, III. The Staff
Group Study of advanced topics in pathology. (S/U grading only.)

299. **Research in Veterinary Pathology** (1-12) I, II, III. The Staff
(S/U grading only.)

Pediatrics

See Medicine, School of

Pharmacology

See Medicine, School of

Pharmacology and Toxicology

See Pharmacology and Toxicology (A Graduate Group), below; and Veterinary Pharmacology and Toxicology

Pharmacology and Toxicology (A Graduate Group)

Bruce D. Hammock, Ph.D., Chairperson of the Group

Group Office, 4111 Food and Agricultural
Sciences Building
(Department of Environmental Toxicology,
752-1042)

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.

Graduate Advisers. A.R. Buckpitt (*Veterinary Pharmacology and Toxicology*), A.J. Hance (*Pharmacology*), B.W. Wilson (*Environmental Toxicology*).

Courses in Pharmacology and Toxicology

Graduate Courses

201. **Principles of Pharmacology and Toxicology** (5) I, Hsieh (Environmental Toxicology)

Lecture—3 hours; discussion—1 hour; laboratory-demonstration—3-4 hours. Prerequisite: Biochemistry 101B, Physiology 110. Part one of a three consecutive quarter sequence. General concepts underlying the metabolic fate and actions of chemicals (drugs and toxicants) in biological systems, including physicochemical properties, dose-response, disposition kinetics, metabolism, mechanisms of chemobiological interaction, and safety evaluation procedures.

202. **Effects of Drugs and Toxicants on Body Systems and Organs** (5) II. Gini (Veterinary Pharmacology and Toxicology)
Lecture—3 hours; discussion—1 hour; laboratory-demonstration—3-4 hours. Prerequisite: satisfactory completion of course 201. Part two of a three consecutive quarter sequence. Mechanisms of action, pharmacologic and toxic effects, and pathologic changes produced by drugs and other chemical substances on various body systems and their associated organs.

203. **Effects of Drugs and Toxicants on Body Systems and Organs** (5) III. Stark (Pharmacology)
Lecture—3 hours; discussion—1 hour; laboratory-demonstration—3-4 hours. Prerequisite: courses 201 and 202. Part three of a three consecutive quarter sequence. Mechanisms of action, pharmacologic, toxic effects, and pathologic changes produced by drugs and other chemical substances on various body systems and their associated organs.

230. **Advanced Topics in Pharmacology and Toxicology** (1-3) I, II, III. Segal (Veterinary Pharmacology and Toxicology)
Lecture-discussion-seminar—1 hour each (course format can vary at option of instructor). Prerequisite: course 201 and consent of instructor. In-depth coverage of selected topics for graduate students in Pharmacology-Toxicology and related disciplines. Topics determined by instructor in charge for each quarter.

290. **Seminar** (1) I, II, III. The Staff
Prerequisite: consent of instructor. Current topics in pharmacology and toxicology. (S/U grading only.)

Philosophy

(College of Letters and Science)

Michael V. Wedin, Ph.D., Chairperson of the Department

Department Office, 118 Philosophy Building
(752-0607)

Faculty

Ronald A. Arbini, Ph.D., Associate Professor
William H. Bossart, Ph.D., Professor
Joel I. Friedman, Ph.D., Professor
Neal W. Gilbert, Ph.D., Professor Emeritus
Marjorie Grene, Ph.D., Professor Emeritus
James R. Griesemer, Ph.D., Assistant Professor
Jean Hampton, Ph.D., Associate Professor
Richard Healey, Ph.D., Associate Professor
Michael Jubien, Ph.D., Professor
John F. Malcolm, Ph.D., Professor
George J. Matthey II, Ph.D., Associate Professor
Michael V. Wedin, Ph.D., 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 thinking critically and precisely about fundamental philosophical 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 and growth.

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.

Philosophy

A.B. Major Requirements:

Preparatory Subject Matter	UNITS
Philosophy 12, 21, 22, 23	16
Depth Subject Matter	36
Upper division units in Philosophy selected with approval from the major adviser	36
Total Units for the Major	52

Major Advisers. G.J. Matthey, J.F. Malcolm.

Minor Program Requirements:

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.

Philosophy	UNITS
Ordinarily, 20 upper division units in philosophy, chosen in consultation with minor adviser.	20

Minor Adviser. R.A. Arbini.

Courses for Non-Majors. The department offers a range of courses for non-majors. Philosophy 1 is a General Education course for the non-major. Students pursuing careers in agriculture and engineering might find Philosophy 5 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 ongoing faculty and graduate student colloquia. Undergraduate students are welcome to attend and join these discussions. Information can be obtained in the department office.

Graduate Study. The Department of Philosophy offers programs of study leading to the M.A. and Ph.D. degrees. Detailed information may be obtained by writing to the Graduate Adviser.

Graduate Adviser. W.H. Bossart.

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. General Education credit: Civilization and Culture/Introductory.

5. Critical Reasoning (4) I, II, III. The Staff

Lecture—3 hours; discussion—1 hour. 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. Not open to students who have completed course 6.

***6. Critical Reasoning and Writing** (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Criteria of good reasoning in everyday life and in science. Basic principles of deduction and induction; fallacies in reasoning; techniques and aids to reasoning; principles of scientific investigation; aids to clarity. Critical writing component will fulfill lower division composition requirement. Not open to students who have completed course 5.

10A-G. Themes in Philosophy

(4) I. Griesemer
Lecture-discussion—3 hours; papers or written reports. Introductory study of related problems in an area of philosophical interest. Sections to be offered: (A) Knowledge and Existence; (B) Self and Mind; (C) Philosophy and the Arts; (D) Morals and Politics; (E) Philosophy East and West; (F) Philosophy and Myth; (G) Science and Human Nature. General Education credit for courses 10B, 10D: Civilization and Culture/Introductory.

12. Introduction to Logic (4) I. Matthey

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. The Staff

Lecture—3 hours; term paper. Philosophical issues and positions involved in contemporary moral and social problems. Among possible topics are: civil disobedience and revolution, racial and sex discrimination, environment and population control, genetic engineering, technology and human values, sexual morality, freedom in society. General Education credit: Civilization and Culture/Introductory.

***18. Cosmology and Culture: Interactions between Religion and Science** (4) II. Griesemer, Janowitz (Religious Studies)

Lecture—3 hours; discussion—1 hour. Prerequisite: one lower division course in philosophy or religious studies recommended. Interdisciplinary introduction to religious and scientific cosmologies, focusing on their interplay. Primary goal of the course is to develop skills in analyzing cultural presuppositions and their fundamental role in science and religion. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any introductory GE course in philosophy or religious studies. (Same course as Religious Studies 18.)

21. History of Philosophy: Ancient (4) I, Malcolm

Lecture—3 hours; discussion—1 hour. Survey of Greek philosophy with special attention to the Pre-Socratics, Plato and Aristotle.

22. History of Philosophy: Seventeenth Century (4) II. Arbini

Lecture—3 hours; discussion—1 hour. Selections from Descartes, Spinoza, Leibniz and Hobbes. General Education credit: Civilization and Culture/Introductory.

23. History of Philosophy: Eighteenth Century (4) III. Matthey

Lecture—3 hours; discussion—1 hour. Selections from Locke, Berkeley, Hume, and Kant. General Education credit: Civilization and Culture/Introductory.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

(Certain upper division courses may not be offered every year.)

***100. Founders of Modern Thought** (4) III. The Staff

Lecture-discussion—3 hours; term paper. Prerequisite: not open to philosophy majors or students who have received credit for courses 22 or 23. A survey of modern philosophy from Descartes to Kant. Major emphasis upon problems still current today.

101. Metaphysics (4) I, Jubien

Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Theories of being. Such topics as reality, substance, universals, space, time, causality, becoming, body, experience, persons, freedom and determinism. Views of the nature and method of metaphysics. Anti-metaphysical arguments. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Philosophy 1, 22, or 23.

102. Theory of Knowledge (4) I, Matthey

Lecture-discussion—4 hours. Prerequisite: one course in philosophy recommended. Philosophical problems of perception and thought, memory and pre-cognition, imagination, truth and error, belief and knowledge. Types of epistemology. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Philosophy 1, 22, or 23.

103. Philosophy of Mind (4) II. Friedman

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. The Staff

Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Logical, metaphysical, epistemological and existential aspects of selected religious concepts and problems. General Education credit: Civilization

and Culture/Non-Introductory. Recommended GE prerequisite: Philosophy 1 or Religious Studies 1, 2, 21, or 40.

107. Philosophy of the Physical Sciences (4) II. Healey
Lecture-discussion—3 hours; term paper. Prerequisite: one philosophy course or a science background recommended. Nature of testability and confirmation of scientific hypotheses; nature of scientific laws, theories, explanations, and models. Problems of causality, determinism, induction, and probability; the structure of scientific revolutions. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Philosophy 1, 22, or 23.

108. Philosophy of the Biological Sciences (4) III. Griesemer
Lecture—3 hours; discussion—1 hour. Prerequisite: one course in biology or one course in philosophy. Scientific method in biology. Nature of biological theories, explanations and models. Problems of evolutionary theory, ecology, genetics, and sociobiology. Science and human values. General Education credit: Civilization and Culture or Nature and Environment/Non-Introductory. Recommended GE prerequisite: (CC) any introductory GE course in philosophy; (NE) Biological Sciences 10, Botany 10, or Genetics 10.

***109. Philosophy of the Social Sciences (4) II.** The Staff
Lecture-discussion—4 hours. Prerequisite: one philosophy course or a 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. Jubien
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. History of Ethics (4) I. Arbini
Lecture—3 hours; term paper. Prerequisite: one philosophy course recommended. 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.** The Staff
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) III. Hampton
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. Hampton
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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 2.

***118. Philosophy of History (4) II.** The Staff
Lecture-discussion—3 hours; term paper. Survey of philosophical theories of history and an analysis of contemporary problems of historical explanation.

***123. Aesthetics (4) I.** 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) II.** Jubien
Lecture-discussion—3 hours; term paper. Prerequisite: course 12 or one course for credit in mathematics. Nature of formal systems and mathematical theories. Selected topics include philosophy of numbers, logical and semantical paradoxes; foundations of mathematics; set theory, type theory, and intuitionistic theory; philosophy of geometry; philosophical implications of Gödel's incompleteness results.

***132. History of Logic (4) II.** Friedman
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy or logic recommended. Overview of the chief developments in the history of logic.

133. Survey of Advanced Logic (4) III. Friedman
Lecture—3 hours; discussion—1 hour. Prerequisite: course 112 or consent of instructor. Survey of topics in mathematical logic includes: axiomatic logic, theory of descriptions, metalogic, models, Tarski's theory of truth, classes and relations,

Russell's Paradox, type theory and axiomatic set theory, Gödel's incompleteness theorems, computability and decidability, and nonstandard logics. Offered in even-numbered years.

***134. Modal Logic (4) III.** Matthey
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.

135. Alternative Logics (4) II. Matthey
Lecture-discussion—4 hours. Prerequisite: course 12, Mathematics 108, or the equivalent. Alternatives to standard truth-functional logic, including many-valued logics, intuitionistic logic, relevance logics, and non-monotonic logics. Applications to computer science. Offered in even-numbered years.

137. Philosophy of Language (4) II. Jubien
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) II.** The Staff
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) III.** The Staff
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. Bossart
Lecture-discussion—4 hours. Prerequisite: courses 21, 22, or 23 recommended. Idealism of Hegel, the pessimism of Schopenhauer, Marxism, the irrationalism of Kierkegaard, Nietzsche and Dostoevsky. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Philosophy 1, 22, 23, History 147A, or 147B.

***155. American Philosophy (4) I.** The Staff
Lecture-discussion—3 hours; term paper. Prerequisite: one course in philosophy recommended. Study of such American thinkers as Peirce, James, Royce, Dewey, Santayana, Whitehead, and C.I. Lewis.

***156. Contemporary British Philosophy (4) III.** 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) III. Malcolm
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) II.** Friedman
Lecture-discussion—4 hours. Prerequisite: course 22.

***170. Leibniz (4) III.** The Staff
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 and Berkeley (4) III.** Matthey
Lecture—4 hours. Prerequisite: course 23. Examination of Locke's *Essay Concerning Human Understanding* and Berkeley's *Principles of Human Knowledge* and *Three Dialogues*. Topics include abstract ideas, existence of matter, primary and secondary qualities, the existence of God, and the nature of scientific knowledge. Offered in odd-numbered years.

***174. Hume (4) I.** Arbini
Lecture-discussion—4 hours. Prerequisite: course 23 recommended.

175. Kant (4) III. Matthey
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, III.** Arbini, Malcolm
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. Jubien
Seminar—3 hours.

202. Theory of Knowledge (4) II. Matthey
Seminar—3 hours.

206. Philosophical Argumentation (4) I. Arbini
Seminar—3 hours. Prerequisite: graduate standing. Investigation and evaluation of philosophical arguments. Critical discussion of student papers on various aspects of philosophical disputes.

207. Philosophy of Science (4) I. Healey
Seminar—3 hours.

212. Philosophical Logic (4) I. Matthey
Seminar—3 hours; term paper. Prerequisite: course 112 and Mathematics 108, or the equivalent. Uses of logic in philosophy, including applications of logic to philosophical problems and formalization of philosophical theories. Philosophical issues in logic, including the nature of logical truth, the correctness of logical systems, and the metaphysical presuppositions of logic. Offered in even-numbered years.

214. Ethics (4) II. Hampton
Seminar—3 hours.

***261. Plato (4) II.** Malcolm
Seminar—3 hours.

262. Aristotle (4) III. Wedin
Seminar—3 hours.

***275. Kant (4) II.** Matthey
Seminar—3 hours.

290. History of Philosophy (4) II. Friedman
Seminar—3 hours. Special topics in the history of philosophy.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Physical Education

(College of Letters and Science)

E. Dean Ryan, Ed.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*)
^{3,4}Edmund M. Bernauer, Ph.D., Professor
G. Robert Biggs, B.A., Lecturer
Robert R. Brooks, M.A., Supervisor
Keith A. Brown, M.A., Lecturer
Robert E. Bullis, M.A., Lecturer
Joseph E. Carlson, M.A., Supervisor
Gary J. Colberg, M.A., Lecturer
Jere H. Curry, M.A., Supervisor
Kathleen M. DeYoung, B.A., Associate Supervisor

Robert L. Foster, M.A., Supervisor
 Pamela L. Gill, M.A., Supervisor
 Raymond S. Goldbar, M.A., Supervisor
 Robert I. Hamilton, M.S., Supervisor
 Jerry W. Hinsdale, A.B., Supervisor
 Jeffery B. Hogan, B.A., Lecturer
 Robert G. Holly, Ph.D., Assistant Professor
 Barbara A. Jahn, M.S., Supervisor
 Susan E. Jennings, Ph.D., Lecturer
 Charles R. Kovacic, Ed.D., Professor Emeritus
³Willard S. Lotter, Ed.D., Senior Lecturer
 Gale E. Mikles, Ed.D., Supervisor
 Paul A. Molé, Ph.D., Associate Professor
 Donald G. Morris, B.S., Lecturer
 Becky Nyby, B.S., Lecturer
 John W. Pappa, M.A., Supervisor
 Melvin R. Ramey, Ph.D., Professor (*Civil Engineering*)
 E. Dean Ryan, Ed.D., Professor
 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
^{3,4}Keith R. Williams, Ph.D., Assistant Professor
^{3,4}Suzanne C. Williams, M.S., Supervisor
 Bobbie J. Wynn, M.A., Assistant Supervisor

Students electing this emphasis must select a minimum of 9 units from Physical Education 110, 111, 112, 113, or 115.

Psychological emphasis:
 Students electing this emphasis must select a minimum of 7 units from Physical Education 120, 121, 122, 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.

Physical Education

B.S.. Major Requirements:

	UNITS
Preparatory Subject Matter	53-59
Anthropology 1	4
Biological Sciences 1	5
Chemistry 1A-1B or 4A-4B	10
Computer science (Computer Science Engineering 10, 30, or Engineering 5)	3
Mathematics 16A-16B or 21A-21B	6-8
Physical Education 45	3
Physics 6A-6B or 8A-8B	8
Psychology 1 or 15	3-4
Statistics 13 or 102	4

Additional Requirements

<i>Biomechanics emphasis:</i> Zoology 2, and Physics 6C or 8C	8
<i>Exercise Physiology emphasis:</i> Chemistry 8A-8B, or 128A-128B and 129A-129B	6-10

Depth Subject Matter

Human Anatomy 101, 101L	6
Physical Education 101, 102, 103, 104, 105	16
Physiology 110, 110L	7
Restricted electives	24

1 Minimum of 12 upper division units from outside the major selected with adviser's approval and as specified below. (Variable-unit courses may not be used to fulfill this requirement.)

Biomechanics emphasis: at least 7 of the 12 units must be selected from the following: Engineering 102A, Mathematics 128A, Physiology 112, Zoology 106, 106P.

Exercise Physiology emphasis: at least 7 of the 12 units must be selected from the following: Psychological Sciences 101A, Physiology 112, 113, 148.

2 Minimum of 12 upper division units of Physical Education courses, including

Biomechanics emphasis: Physical Education 113, 115, 125.

Exercise Physiology emphasis: 9 units selected from Physical Education 110, 111, 112, 113.

Total Units for the Major 106-112

Honors Program

Those students with outstanding records in the major requirements may elect to enter the Honors Program with the consent of an adviser. A senior project must be completed, for which up to 10 units of Physical Education 199 (split over two quarters) may be earned. These units are taken in addition to the major requirements, and it should be realized

that only a maximum of ten 199 units may be counted toward the B.S. degree total unit requirement.

Major Advisers. W. C. Adams, E. M. Bernauer, R. G. Holly, S.E. Jennings, 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 three options 18	
a. Biomechanics	
1) Physical Education 103 and one course from 101, 102, 104, 105	
2) Minimum of two courses from Physical Education 113, 115, 125	
3) Additional courses to complete a total of 18 upper division units.	
b. Exercise Physiology	
1) Physical Education 101, and one course from 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	
c. Psychological Aspects	
1) Physical Education 105, and one course from 101, 102, 103, 104	
2) Minimum of two courses from Physical Education 120, 121, 122, 125	
3) Additional courses to complete a total of 18 upper division units	

Minor Advisers. Same as major advisers.

Teaching Credential Subject Representative. H. A. Schmalenberger. See also the section on 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. See also the Graduate Division section in this catalog.

Graduate Adviser. W.C. Adams.

Class and Recreational Use of Facilities. The incidental fee payable by all students at the time of registration, entitles students to the use of gymnasium, showers, towels, lockers, tennis courts, and the athletic fields. Certain equipment for games and sports is available for exercise and recreation, either with or without instruction. Lockers will be turned in on the last day of class, i.e., before the final examination period.

Fines are imposed for each formal transaction necessitated by failure of the student to comply with the regulations of the department.

Courses in Physical Education

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. Prerequisite: activity-level background comparable to that in course 1 for specific activity recommended. 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. Hinsdale, Jahn
Lecture—1 hour; laboratory—2 hours. Prerequisite: course 5; sound physical condition, and no physical handicap that would render student unable to perform the required skills and ability to pass preliminary swimming test. Provides the student with the knowledge, organizational procedures, and skill development necessary to provide for water safety and save his 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, II, Morris
Lecture—2 hours; laboratory—2 hours. Prerequisite: good physical condition, ability to pass preliminary swim test, and consent of instructor. Introduction to basic knowledge required for SCUBA diving, function and maintenance of equipment, physics and physiology of diving, diver first aid and CPR, oceanography and marine life, and underwater communication. Pool and open water sessions available for certification. (P/NP grading only.)

35A. Dance Composition (2) I, Wynn
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, Wynn
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, Wynn
Laboratory—5 hours. Prerequisite: courses 35A, 35B, or consent of instructor. To encourage the student to create new dance forms and prepare them for a 4-7 minute presentation in a spring concert on stage. Costumes and lighting will be created and correlated for each dance by the choreographer.

36A-36B. History of Dance (3-3) I-II, 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, Gill
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 meth-

ods 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 teacher's aide in physical education activities, including athletic coaching, in public schools under the guidance of a regular teacher with supervision by a departmental faculty person. (P/NP grading only.)

101. Physiological Regulation During Exercise (4) I, Bemauer, 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, —
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.
Lecture—3 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: Human Anatomy 101 and Physics 1A; Physics 6A recommended. Anatomical and mechanical fundamentals of human motion. Qualitative and quantitative application of kinesiological principles to a variety of movement situations.

104. Introduction to Motor Control and Skill Acquisition (3) I, ———, Jennings
Lecture—2 hours; discussion—1 hour 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, II, Ryan
Lecture—3 hours. Prerequisite: Psychology 1, 15, or 16. Survey of theories and experimental findings from social psychology and human motivation and their application to motor performance, including sex differences, success and failure, expectations, anxiety, competition, and aggression.

110. Exercise Metabolism (3) II, Molé
Lecture—2 hours; laboratory—five 4-hour sessions. Prerequisite: course 101, 102; Chemistry 1A. Focus on energy metabolic pathways and fuels used during different modes of exercise. Also, exercise-induced adaptations which affect metabolism and performance will be discussed. Experiments in laboratory will utilize a variety of techniques to characterize the metabolic responses to exercise.

111. Environmental Effects on Physical Performance (3) III, ———, Adams
Lecture—2 hours; laboratory—3 hours, with discussion—1 hour (alternate weeks). Prerequisite: courses 101 and 102, or consent of instructor. The effects of thermal, barometric and gravitational conditions on physiological function and physical performance of humans. Acute and chronic effects, emphasizing physiological adaptations and limitations will be studied.

112. Clinical Exercise Physiology (4) III, Holly
Lecture—3 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: courses 101 and 102, or consent of instructor. Physical activity as a therapeutic modality is examined in normal and diseased populations (cardiovascular, pulmonary, diabetic). Assessment (graded exercise testing), exercise prescription and effects of exercise conditioning are examined in detail.

113. Growth and Development in Human Performance (3) II, 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) I, K. Williams
Lecture—2 hours; laboratory—3 hours to alternate weekly with discussion—1 hour. Prerequisite: course 103 or consent of instructor. Biomechanical bases of human movement investigated; topics include musculo-skeletal mechanics, tissue mechanics, electromyography, and measurement and analysis techniques. Application made to sport, clinical, and work environments, including extensive analysis of locomotion.

117. Exercise and Aging in Health and Disease (3) II, Holly
Lecture—2 hours; discussion—1 hour. Prerequisite: course 101 or 102 (concurrently) or 113 (concurrently). Etiology of and standard therapy for various diseases associated with aging (e.g., cardiovascular, pulmonary and renal diseases, diabetes, obesity, lipemias, etc.). Exercise will then be considered as a protective and/or therapeutic modality.

***118. Physical Fitness in the Work Place** (3) III, Bemauer
Lecture—2 hours; discussion—1 hour. Explores principles and practices of health promotion in the work place. Established assessment procedures including validation of job standards are presented. Cost and health benefits are examined with respect to onsite and offsite programs of fitness maintenance and remediation.

120. Sports in American Society (4) I, Gill
Lecture—3 hours; discussion—1 hour. Historical development of sport in American society. Relationship and interaction of sport and politics, economics, religion, art, sexism, racism, and education; current trends and problems.

121. Sports Psychology (4) III, Ryan
Lecture—3 hours; discussion—1 hour. Prerequisite: course 105 and Psychology 145. Consideration of major theories, research findings and methods of data collection in sport psychology through a critical examination of relevant experimental, clinical, and field data.

122. Psychological Effects of Physical Activity (3) II, Jennings
Lecture—3 hours. Prerequisite: Psychology 1 or 15. Physical activity is evaluated in terms of its ability to enhance the quality of life. Topics studied include: individual factors (self concept, type A); special populations (elderly, cardiovascular); and mental health changes (depression, anxiety).

125. Neuromuscular and Behavioral Aspects of Motor Control (3) II, K. Williams, Jennings
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, 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. Prevention and Care of Sports Injuries (3) II, III, Pappa
Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 5 and 45. Management of the prevention, care, and rehabilitation of injuries incurred by athletes. Laboratory on anatomy, emergency care, physical therapy methods, and taping techniques.

140. Principles and Theory of Physical Education (4) II. 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. Schmalenberger
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) I, 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.)

145. Administration of Health/Fitness Programs (2) III. Mikles
Lecture—2 hours. Principles of organizing and directing health/fitness programs. Includes selection and training of personnel, methods of evaluating personnel and programs, and elements of planning.

146. Theory and Practice of Exercise Training (1) I, II, III. Holly, Jennings
Lecture-discussion—1 hour. Prerequisite: course 2 or 45 or 102. Physiological adaptations, exercise programming and behavioral techniques focusing on young and middle-aged adults. Topics include exercise prescription, nutrition, psychological effects of exercise, stress management techniques, and exercise adherence techniques. (P/NP grading only.)

146L. Shape-Up Testing and Training Laboratory (1) I, II, III. Holly, Jennings
Laboratory—3 hours. Prerequisite: course 146 (may be taken concurrently). Primary activities involve leading shape-up class, attending workshop testing sessions, and completing final reports. May be repeated once for credit. (P/NP grading only.)

147L. Adult Fitness Training Laboratory (1) I, II, III. Holly, Jennings
Laboratory—3 hours. Prerequisite: courses 146, 146L, and 102 (may be taken concurrently); current CPR. Involves attending and assisting with aerobic training sessions for older adults, and assisting with physiological testing sessions. (P/NP grading only.)

148. Theory and Practice of Exercise Testing (1) I, II, III. Holly
Lecture-discussion—1 hour. Prerequisite: courses 101, 102, 112 (may be taken concurrently), and 146; current CPR. Theory and practice of exercise testing applied to older adult populations. Physiological responses to and limitations of exercise testing. Application of exercise testing and training to healthy and diseased populations. (P/NP grading only.)

148L. Adult Fitness Testing Laboratory (1) I, II, III. Holly
Laboratory—3 hours. Prerequisite: courses 146, 148 (concurrently); current CPR. Testing symptomatic and asymptomatic older adults for functional aerobic capacity, body composition, blood lipids, pulmonary function, and cardiovascular disease risk. Counseling adults in appropriate exercise programs and lifestyle modifications. Two quarters minimum; third quarter permitted. (P/NP grading only.)

149L. Cardiopulmonary Rehabilitation Laboratory (1) I, II, III. Holly
Laboratory—3 hours. Prerequisite: courses 148 and 148L; current CPR certification. Testing and training of cardiac patients or individuals at high risk of developing heart disease. Present mini-lectures to program participants, maintain patient records, and present patients' cases in rounds. Two quarters minimum; third quarter permitted. (P/NP grading only.)

150. Recreation in the Community (3) III. Jahn
Lecture—2 hours; discussion—1 hour; two Saturday field trips—8 hours. The nature and scope of community recreation programs in California emphasizing low income, highly populated areas and poor rural communities.

192. Physical Education Internship (2-12) I, II, III. The Staff (Chairperson in charge)
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 chairperson. Tutoring of students in lower division physical activity courses. Written reports on methods and materials required. May be repeated once for credit. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of Department Chairperson. (P/NP grading only.)

Graduate Courses

200A. Introduction to Research: History and Philosophy in Physical Education (2) I, Molé, Bernauer
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. Bernauer
Lecture—2 hours; laboratory—1 hour. Prerequisite: graduate students with upper division course in systemic physiology or anatomy, and medical students. Multidisciplinary course introducing student to the pathophysiology of sports injuries, physical examination of the injured athlete, and management of sports injuries. Specific injuries, taping, and use of physical modalities will be discussed. (Same course as Physical Medicine and Rehabilitation 201A.)

***220. Research Topics in Biomechanics (3) III.** K. Williams
Lecture—2 hours; seminar—1 hour. Prerequisite: graduate standing; course 115 recommended. Survey of current research into diverse areas of biomechanics of human movement. Topics include locomotion, sport biomechanics, electromyography, musculo-skeletal and tissue mechanics, advances in measurement technology, and clinical biomechanics. Offered in odd-numbered years.

221. Anthropometry in Physical Activity (3) III. Adams
Lecture—2 hours; laboratory—five 3-hour sessions to alternate weekly with five 1-hour discussion sessions. Prerequisite: courses 101 and 102. Consideration of physical constitution, body proportions, and body composition in man as they affect physical performance, and of body structural and compositional changes accompanying prolonged, systematic physical conditioning. Offered in even-numbered years.

222. Metabolic Functions in Exercise (4) III. Molé
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 102, Physiology 114. Review of the current research literature on the metabolic responses to exercise in man; a laboratory survey of respiratory response, metabolic and water balances, blood gas adjustments and acid-base balance with particular reference to the effect of environmental conditions.

***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 tests and on obtaining the most accurate and reliable results.

227. Research Techniques in Biomechanics (3) I, K. Williams
Lecture—2 hours; laboratory—3 hours. Prerequisite: consent of instructor; Physical Education 115 recommended. Experimental techniques for biomechanical analysis of human movement are examined. Techniques evaluated include data acquisition and analysis by computer, force platform analysis, strength assessment, planar and three-dimensional cinematography, data reduction and smoothing, body segment parameter determination, electromyography, and biomechanical modelling. (Same as Biomedical Engineering 227.)

230. Human Performance: Psychological Aspects (3) II. Ryan
Seminar—3 hours. Prerequisite: course 105 or consent of

instructor. Critical review of current literature on learning with emphasis on social learning theory and its application to clinical problems related to exercise and sport.

232. Health Psychology: Effects of Physical Activity (3) I. Jennings
Seminar—3 hours. Prerequisite: course 122 or consent of instructor. Analysis of research on the role of physical activity in developing, maintaining, or changing personality and affective states. Special attention will be paid to the potential effect of exercise on mental health.

290. Seminar in Physical Education (1) III. The Staff (_____ in charge)
Seminar—1 hour. Prerequisite: graduate standing; required of all first year students for first two quarters. Presentation and discussion of topics of interest, and the analysis of research in physical education. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing; consent of instructor. (S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing; consent of instructor and Department Chairperson. (S/U grading only.)

Professional Courses

300. The Elementary Physical Education Program (2) 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. Schmalenberger
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)

Robert N. Shelton, Ph.D., Chairperson of the Department

Wendell H. Potter, Ph.D., Vice Chairperson of the Department

Department Office, 225 Physics-Geology Building (752-1500)

Faculty

Robert H. Becker, Ph.D., Associate Professor

Franklin P. Brady, Ph.D., Professor

Thomas A. Cahill, Ph.D., Professor

Ling-Lie Chau, Ph.D., Professor

Lawrence B. Coleman, Ph.D., Associate Professor

⁴Linton R. Corruccini, Ph.D., Professor

James E. Draper, Ph.D., Professor

Glen W. Erickson, Ph.D., Professor

Ching-Yao Fong, Ph.D., Professor

^{2,3}Claude Garrod, Ph.D., Professor

⁴Kenneth R. Greider, Ph.D., Professor

John F. Gunion, Ph.D., Professor

James P. Hurley, Ph.D., Professor

John A. Jungerman, Ph.D., Professor

²Joseph E. Kiskis, Ph.D., Professor

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

Werner Nahn, Ph.D., Visiting Associate Professor

Neal Peek, Ph.D., Senior Lecturer

David E. Pellett, Ph.D., Professor
Wendell H. Potter, Ph.D., Associate Professor
Roderick V. Reid, Jr., Ph.D., Associate professor
Robert N. Shelton, Ph.D., Professor
William W. True, Ph.D., Professor
David E. Webb, Ph.D., Assistant 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. UC Davis 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 8A 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. All specifically listed physics courses required for a bachelor's degree in physics should be taken for a letter grade.

Applied Physics

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	55
Physics 8A, 8B, 8C, 8D	16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C	21
Engineering 5 (or equivalent programming course)	3
Chemistry 1A-1B-1C or 4A-4B-4C	15
Any recommended courses for a particular concentration.	
Depth Subject Matter (Common Core)	54
Physics 104A, 104B, 105A, 105B, 110A, 110B, 112A, 115A, 118A, 116B, 122	35
At least 19 units from approved courses within one of the following concentrations chosen in consultation with a major adviser	19
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	109

Physics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	40
Physics 8A, 8B, 8C, 8D	16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C	21
Engineering 5 (or equivalent programming course)	3
Depth Subject Matter	39
Physics 104A, 104B, 105A, 105B, 110A, 110B, 112A, 115A, 122	27
At least 7 units from Physics 105C, 110C, 112B, 115B, 127, 129A, 129B, 129C, 140A, 140B	7
At least 5 additional upper division units in physics. (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	79

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	55
Physics 8A, 8B, 8C, 8D	16
Mathematics 21A, 21B, 21C, 22A, 22B, 22C	21
Engineering 5 (or equivalent programming course)	3
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 10 units from Physics 105C, 112B, 127, 129A, 129B, 129C, 140A, 140B	10
At least 11 additional upper division units from physics. (No more than 6 units in courses numbered 194H, 195, 198, and 199 may be applied in satisfaction of this requirement.)	11

Units for the Major

Recommended Electives

Astronomy: Astronomy 2.

Computer and numerical analysis: Mathematics 128A or Applied Science Engineering 115.

Statistics: Statistics 131A.

Advanced mathematics: Mathematics 106, 118A-118B, 119, 121A-121B, 127A-127B-127C, 185A-185B; Physics 10 (history and philosophy of physics). No credit after any other physics course (except 7, 37/137).

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, 233 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	18-24
Classical Physics emphasis	22
Physics 104A-104B, 105A, 105C, 108, 108L, 110A-110B.	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 require 105B.)	

	UNITS
Quantum Physics emphasis	24
Physics 104A-104B, 112A, 105A-105B, 110A, 115A-115B	18-24
(Physics 104A-104B and 105A-105B must precede 115A-115B.)	

	UNITS
General Physics emphasis	24
Physics 104A-104B, 105A-105B, 110A-110B, 112A, 115A	24
(Physics 104A-104B and 105A-105B must precede 115A.)	

Teaching Credential Subject Representative. R. V. Reid. See also the section on the Teacher Education Program.

Graduate Study. The Department of Physics offers programs of study and research leading to the M.S. and Ph.D. degrees and the Ph.D. degree with an Applied Physics Research Specialty. Further information regarding requirements for these three degrees, graduate research, teaching assistantships, and research assistantships may be obtained by writing to the Chairperson, Department of Physics, University of California, Davis 95616.

Astronomy. There is no major program leading to a degree in Astronomy. Introductory courses are offered in general astronomy and astrophysics. Students who wish to use the observatory or the portable telescopes may do so through the Astronomy Club. The graduate program in physics provides research opportunities in radio-astronomy or microwave astrophysics.

Courses in Astronomy

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 non-mathematical description of modern astronomy with emphasis on the structure and evolution of stars, galaxies, and the Universe. The Sun and the solar system. Optional topics include pulsars, black holes, quasars, and extra-terrestrial communications. Not open to students who have received credit for course 2 or any physics course (except 7, 10, 37/137). General Education credit: Nature and Environment/Introductory.

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 physics majors about the various fields of physics now under intensive study. Open to Physics and Applied Physics majors only.

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 6 is a three-quarter sequence using some calculus (mostly concepts rather than calculations) and including laboratory work as an integral part. The entire sequence is recommended, rather than just 1 or 2 quarters.

Physics 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. McCoim
Lecture—3 hours. Prerequisite: trigonometry or consent of instructor. Mechanics. Introduction to general principles and analytical methods used in physics with emphasis on applications in applied agricultural and biological sciences and in physical education. Not open for credit to students who have completed course 6A or 8A (or former 2A).

1B. Principles of Physics (3) II. McCoim
Lecture—3 hours. Prerequisite: course 1A or 6A (or former 2A); and consent of instructor. Continuation of course 1A. Heat optics electricity, modern physics. Not open for credit to students who have completed course 6B, 6C, 8B, 8C, or 8D (or former 2B or 2C).

6A. General Physics (4) I, II. The Staff
Lecture—3 hours; laboratory—2.5 hours. Prerequisite: Mathematics 16B (may be taken concurrently). Mechanics and fluids. Introduction to general principles and analytical methods used in physics. Primarily for biological science majors. Students who have had course 2A or 8A may not receive credit for course 6A; those who have had course 1A may receive only 2 units of credit. (CAN Phys Seq A)

6B. General Physics (4) II, III. The Staff
Lecture—3 hours; laboratory—2.5 hours. Prerequisite: course

6A, or 1A with consent of instructor; Mathematics 16B or Physics 8A. Continuation of course 6A. Electricity and magnetism, kinetic theory and thermodynamics. Students who have had course 2B or 8B may not receive credit for course 6B; those who have had course 1B may receive only three units of credit. (CAN Phys Seq A)

6C. General Physics (4) I, III. The Staff
Lecture—3 hours; laboratory—2.5 hours. Prerequisite: course 6B. Continuation of course 6A-6B. Wave phenomena, optics, modern physics. Students who have had course 2C or 8C may not receive credit for course 6C; those who have had course 1B may receive only three units of credit. (CAN Phys Seq A)

7. Contemporary Directions in Physics (1) II. The Staff
Lecture—1 hour; one hour field trip to campus laboratory. Prerequisite: open to Physics and Applied Physics majors only. 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; laboratory—3 hours. Prerequisite: Mathematics 21B. Mechanics. Introduction to general principles and analytical methods used in physics for physical science and engineering majors. Only two units of credit allowed for students who have completed course 1A (or former 2A); only one unit of credit allowed for students who have completed course 6A. (CAN Phys 8)

8B. Classical Physics (4) I. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 8A or 6A with consent of instructor; Mathematics 21C, and 22C (may be taken concurrently). Continuation of course 8A. Fluid mechanics, electricity and magnetism including circuits and Maxwell's equations. Only two units of credit allowed to students who have completed course 1B (or former 2B); and only one unit allowed to those who have completed course 6B. (CAN Phys 12)

8C. Classical Physics (4) II. The Staff
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. Not open for credit to students who have completed Engineering 105A; and only 2 units of credit allowed to those who have completed course 6B or 6C (or former 2B or 2C). (Can Phys 10)

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. Only 2 units of credit allowed to students who have completed course 6C (or former 2C).

10. Basic Concepts of Physics (4) I, II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: high school algebra. Survey of basic principles: motion, gravitation, electricity and magnetism, light, relativity, atoms, quanta, nuclei, elementary particles. Includes lecture demonstrations and elementary problem solving. Check with the department office for the emphasis (history/philosophy, energy/environment, natural phenomena, etc.) each quarter. Students who have had any other physics course (except 7, 37/137) will not receive credit for course 10. General Education credit: Nature and Environment/Introductory.

37. Physics of Nuclear Arms Effects and Control (1) II. Jungerman
Lecture—discussion—1 hour. Prerequisite: high school algebra; course 137 (concurrently). Intended for students in Letters who have not had any other physics course and who are also concurrently enrolled in course 137. Course will emphasize physics concepts of course 137. Students who have had any other physics course will not receive credit for course 37. (Same course as Applied Science Engineering 37.)

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor; primarily for lower division students. (P/NP grading only.)

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
Prerequisite: consent of instructor. (P/NP grading only.)

Upper Division Courses

104A-104B. Introduction to Methods of Mathematical Physics (3-3) I-II. Erickson
Lecture—3 hours. Prerequisite: courses 8B, 8C, 8D, Mathematics 22A, 22B, 22C passed with grade C- or better, or consent of department. Elements of vector and tensor analysis, matrix methods, boundary value problems, integral transforms with applications to physics.

105A-105B. Analytical Mechanics (3-3) I, II. Ko
Lecture—3 hours. Prerequisite: course 8B, 8C, 8D, Mathematics 22A, 22B, 22C passed with grade C- or better, or consent of department. Principles and applications of Newtonian mechanics; 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 6 sequence and Mathematics 21 sequence or consent of instructor. The phenomena of diffraction, interference, and polarization of light, with applications to current problems in astro-physics, material science, and atmospheric science. Study of modern optical instrumentation. Open to non-majors.

108L. Optics Laboratory (1) III. Cahill
Laboratory—3 hours. Prerequisite: course 108 concurrently. The laboratory will consist of one major project pursued throughout the quarter, based on modern applications of optical techniques.

110A-110B-110C. Electricity and Magnetism (3-3-3) I-II-III. True
Lecture—3 hours. Prerequisite: courses 8B, 8C, 8D, Mathematics 22A, 22B, 22C passed with grade C- or better; or consent of department. Theory of electrostatics, electromagnetism, Maxwell's equations, electromagnetic waves.

112A-112B. Thermodynamics and Statistical Physics (3-3) I-II. Corruccini
Lecture—3 hours. Prerequisite: courses 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 (3-3) III-I. Jungerman
Lecture—3 hours. Prerequisite: courses 104B and 105B passed with grade C- or better, or consent of chairperson. The classical background, basic ideas, and methods of quantum mechanics, with applications to atomic physics.

116A. Electronic Instrumentation (4) II. Pellet
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. McCoim
Lecture—3 hours; outside work—9 hours. Prerequisite: course 8D; Mathematics 21C. The phenomena of atomic physics; introduction to quantum phenomena and quantum mechanics; selected topics dealing with atoms, molecules, nuclei, and the solid state.

122A. Advanced Physics Laboratory: Atomic/Solid-State (3) I, II. Corruccini
Laboratory—8 hours. Prerequisite: course 8D. Experimental techniques and measurements in atomic and solid-state physics; e.g., spectroscopy, optical pumping, magnetic resonance, superconductivity, semiconductors, ferroelectricity. The student performs three to six experiments depending on difficulty. Individual work is stressed.

122B. Advanced Physics Laboratory: Nuclear/High Energy (3) I, II. Pellet
Laboratory—8 hours. Prerequisite: course 8D. Similar to course 122A with experiments in gamma-ray coincidence, Mossbauer Effect, Rutherford scattering, muon lifetime, others. Student performs three to six experiments; some of these may be chosen from course 122A.

123. Applications of Nuclear Physics (3) I. Peek
Lecture—2 hours; laboratory—3 hours. Prerequisite: course 8D. 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. Not offered every year.

127. Introduction to Astrophysics (3) II. Becker
Lecture—3 hours. Prerequisite: course 105A. Celestial mechanics, radiation, astrophysical measurements, electromagnetic processes, the sun, binary and variable stars, stellar structure and evolution, galaxies, cosmology.

129A. Introduction to Nuclear and Particle Physics (3) I. Brady
Lecture—3 hours. Prerequisite: course 115A. Survey of basic nuclear properties and concepts requiring introductory knowledge of quantum mechanics.

129B. Nuclear Physics (4) II. Knox
Lecture—3 hours; outside work—9 hours. Prerequisite: courses 115B, 129A. Continuation of course 129A.

129C. Elementary Particle Physics (4) III. Lander
Lecture—3 hours; term paper. Prerequisite: courses 115B and 129A. 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 (Applied Science)
Lecture—3 hours. Prerequisite: upper division standing; one course from courses 1B, 6C, 8D, 10 or 37; course 37 (recommended 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. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Physics 10. (Same course as Applied Science Engineering 137.)

140A. Introduction to Solid-State Physics (3) II. Webb
Lecture—3 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. Webb
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, McCollm
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, Yager
Lecture—3 hours. Prerequisite: courses 104B, 105B, and 110C or the equivalent; Mathematics 203A (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 203A, 203B, 203C.

200B. Theory of Mechanics and Electromagnetics (3) II. Yager
Lecture—3 hours. Prerequisite: course 200A; Mathematics 203B (concurrently). Hamilton's equations. Hamilton-Jacobi theory and contact transformations, action-angle variables and perturbation theory, selected topics in mechanics of continuous media; incompressible and compressible flow, gravity waves and shock theory.

200C. Theory of Mechanics and Electromagnetics (3) III. Hurley
Lecture—3 hours. Prerequisite: course 200B, Mathematics 203C (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, Chau
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. McCollm
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. Draper
Lecture—3 hours. Prerequisite: course 215B. Comprehensive study of the nucleon-nucleon interaction including the deuteron, nucleon-nucleon scattering, polarization, determination of real parameters of S-matrix, and related topics.

***224B. Nuclear Physics** (3) III. Draper
Lecture—3 hours. Prerequisite: course 224A. Study of nuclear models, including shell model, collective model, unified model. Energy level spectra, static moments, and electromagnetic transition rates.

224C. Nuclear Physics (3) I, Draper, Brady
Lecture—3 hours. Prerequisite: course 224B. Study of nuclear scattering and reactions including the optical model and direct interactions. Beta decay and an introduction to weak interactions. Not offered every year.

229A. Advanced Nuclear Theory (3) II. Brady
Lecture—3 hours. Prerequisite: course 224C. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for two-body scattering. Not offered every year.

229B. Advanced Nuclear Theory (3) III. Brady
Lecture—3 hours. Prerequisite: course 229A. Advanced topics in nuclear theory; theory of quantum-mechanical scattering processes. Exact formal theory and models for three-body scattering. Not offered every year.

230A. Quantum Theory of Fields (3) I, Gunion
Lecture—3 hours. Prerequisite: course 215C. Relativistic quantum mechanics of particles; techniques and applications of second quantization; Feynman diagrams; renormalization.

230B. Quantum Theory of Fields (3) II. 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. Not offered every year.

***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. Not offered every year.

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; non-crystalline solids.

245A. High Energy Physics (3) II. Pellett
Lecture—3 hours. Prerequisite: course 230A. Phenomenology and systematics of strong, electromagnetic, and weak interactions of hadrons and leptons; determination of quantum numbers; quarks and quarkonia; deep inelastic scattering; the quark parton model; experiments at hadron colliders and electron-positron colliders.

245B. High-Energy Physics (3) III. Ko
Lecture—3 hours. Prerequisite: course 245A. Electroweak interactions; phenomenology of the Standard Model of

SU(2) \times U(1); weak interaction experiments; properties of and experiments with W and Z vector bosons; Glashow-Weinberg-Salam model and the Higgs boson; introduction to supersymmetry and other speculations.

***245C. High-Energy Physics** (3) III. Gunion
Lecture—3 hours. Prerequisite: course 245A. Strong interaction: quantum chromodynamics phenomenology; jets and other experimental tests; quark and gluon distribution functions; quark and gluon scattering; applications of the renormalization group. Not offered every year.

250. Special Topics on Physics (3) I, II, III. The Staff
Lecture—3 hours. Prerequisite: consent of instructor. Topic varies from year to year. May be repeated three times for credit. Not offered every quarter.

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 (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. Methods of Teaching Physics (1) I, II, III. The Staff
Lecture-discussion—1 hour. Prerequisite: graduate standing in Physics; consent of instructor. Practical experience in methods and problems related to teaching physics laboratories at the university level, including discussion of teaching techniques, analysis of quizzes and laboratory reports and related topics. Required of all Physics Teaching Assistants. May be repeated for credit. (S/U grading only.)

Physiological Sciences

(School of Veterinary Medicine)

Richard A. Freedland, Chairperson of the Department

Department Office, 1094 Haring Hall (752-1373)

Faculty

¹Arthur L. Black, Ph.D., Professor

²Michael L. Bruss, D.V.M., Ph.D., Associate Professor

Victor W. Burns, Ph.D., Professor

²Charles E. Cornelius, D.V.M., Ph.D., Professor

Donald L. Curry, Ph.D., Professor

Richard A. Freedland, Ph.D., Professor

Robert J. Hansen, Ph.D., Professor

^{3,4}Benjamin L. Hart, D.V.M., Ph.D., Professor

Alfred A. Heusner, Docteur-es-Sciences, Professor

James H. Jones, Ph.D., D.V.M., Assistant Professor

James G. Morris, Ph.D., Professor (*Animal Science*)

Stuart A. Peoples, M.D., Professor Emeritus

Quinton R. Rogers, Ph.D., Professor

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 (*Animal Science*); Schneeman (*Nutrition*) 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, Hansen, Hershey (*Biological Chemistry*), Rucker (*Nutrition*) Lecture—3 hours. Prerequisite: course 205A or consent of instructor. Pathways and control in animals of the biosynthesis and degradation of amino acids, proteins, nucleotides and porphyrins; includes hormonal, nutritional, and genetic effects. Offered in odd-numbered years.

220. Physiology of the Liver (3) I. Bruss, Cornelius Lecture—27 hours total; laboratory—12 hours total. Prerequisite: systemic physiology; biochemistry or physiological chemistry. Topics in functional morphology, physiology, intermediary metabolism, pharmacology, and disorders of the liver. Emphasis on bile formation; bile pigments; bile acids; drug and toxin metabolism; circulation; carbohydrate, lipid and protein metabolism; ion transport; and function tests. Offered in odd-numbered years.

230. The Secretory Process (2) I. Curry Lecture—2 hours. Prerequisite: graduate standing or consent of instructor. Structural and intracellular events involved in secretion with emphasis on physiological initiators and modifiers. All secretory systems, but emphasis on the beta cell of the endocrine pancreas as role model. Offered in odd-numbered years.

238. Animal Behavior and Disease Management (2) I. Hart Lecture—2 hours. Prerequisite: graduate standing and upper division course in animal behavior or consent of instructor. Examination of the ways in which animals use behavioral strategies to avoid debilitating viral, bacterial and parasitic

diseases, or to overcome such diseases once they are sick. Main emphasis is on vertebrates, especially wild and domestic mammals. Offered in even-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. Offered in even-numbered years.

280. Advanced Respiratory Physiology (4) II. Jones Lecture—3 hours; discussion—1 hour. Prerequisite: graduate student status or consent of instructor. Advanced study of respiratory physiology with emphasis on principles of ventilation and perfusion, gas distribution, exchange, transport, and delivery at rest, during exercise and at high altitude. Offered in even-numbered years.

290. Seminar (1) I, II, III. The Staff (Chairperson in charge) Seminar—1 hour.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

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 **Animal Physiology; Human Physiology (School of Medicine); Physiology (below and under Zoology); and Plant Physiology**

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 foundation for a challenging career in physiology and also serve as a basis for further training in schools of human and veterinary medicine, medical technology, pharmacy, dentistry, optometry, and other health sciences. Students interested in research and advanced teaching may use the program as preparation for continued study leading to advanced degrees.

Choice of College.

The Bachelor of Science degree is offered in both the College of Agricultural and Environmental Sciences and College of Letters and Science.

Students majoring in Physiology in the College of Letters and Science may petition the Dean of the College to receive credit toward the 64 upper division units required for the degree for certain courses in organic chemistry that have been taken at other institutions prior to first enrollment at UC 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	46-50
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 6A-6B-6C	12
Depth Subject Matter	27
Physiology, including Physiology 100A-100B, 100L, 110, 110L, plus 12 additional units of physiology (Physiology 111A and 111B recommended). These 12 units may include physiology courses offered by other departments (see Physiology brochure for listing of approved courses). No course 192, or more than 3 units of physiology of the allowed 5 units of course 199 as cited under Restricted Electives may be used to meet Depth requirements or used toward these 12 additional units.	

Breadth Subject Matter

<i>College of Agricultural and Environmental Sciences students</i>	16
English (see College requirement)	7
Social Science and/or Humanities	9
(See also the College section for additional requirements.)	

College of Letters and Science students:

Refer to the College section for a description of requirements to be completed in addition to the major.

Restricted Electives

.....	33
Upper division units, science units chosen with adviser's approval. The units must include a two-quarter sequence in biochemistry (Physiological Sciences 101A-101B or Biochemistry 101A-101B) and a morphology course with laboratory, if a laboratory sequence is offered (see Physiology brochure for listing of approved courses). No course 192 or more than 5 units, independently or in combination, of 106A, 106B, 190C, 196A, 196B, and 199 will be accepted as restricted electives. The 5-unit limitation will be reduced by the number of 106A, 106B, 190C, 196A, 196B and 199 units applied to the Physiology Depth Subject Matter.	

Unrestricted Electives

Total Units for the Major 180

Major Adviser. J. M. Goldberg.

Graduate Study. The Graduate Group in Physiology offers programs of study and research leading to the M.S. and Ph.D. degrees. Information on graduate study may be obtained by writing the Graduate Adviser, Department of Animal Physiology. See also the Graduate Division section in this catalog.

Courses in Physiology

Lower Division Courses

2. Introductory Physiology (4) III. The Staff
Lecture—4 hours. Prerequisite: Biological Sciences 1. Physiology of muscular contraction, nervous integration, sensation, circulation, respiration, excretion, and digestion.

2L. Introductory Physiology Laboratory (2) III. The Staff
Laboratory—6 hours. Prerequisite: course 2 (completed or in progress).

10. Elementary Physiology (4) III. The Staff
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.

Upper Division Courses

100A. General Physiology (3) I, Horwitz
Lecture—3 hours. Prerequisite: Biological Sciences 1 and Chemistry 8B; Physics 6B 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. 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
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.

106A. Experiments in Physiology: Design and Execution (3) I. 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) II. 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, Fuller, Ishida, Sillman, Weidner
Lecture—5 hours. Prerequisite: Biological Sciences. Physiology of organ systems; including concepts of integrative and homeostatic mechanisms.

110L. Systemic Physiology Laboratory (2) I, III. Ishida, Adamson
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 (Avian Sciences), Adamson
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. Neuroscience (3) I, Horowitz, Carstens
Lecture—3 hours. Prerequisite: course 110. Advanced presentation of concepts in neuroscience including sensory systems, motor systems, and higher neural integration.

113. Cardiovascular, Respiratory, and Renal Physiology (4) I. Goldberg, Weidner
Lecture—4 hours. Prerequisite: course 110; Chemistry 8B, Physics 6C 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 systems 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
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: circulation. Comparative approach to cardiovascular function in vertebrates and invertebrates.

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) II. Mendel
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. Burger, Cech
Lecture—3 hours. Prerequisite: course 110. Comparisons of physiological functions in the animal kingdom: respiration. Offered in even-numbered years.

120F. Comparative Physiology of Sensory Systems (3) II. Sillman
Lecture—3 hours. Prerequisite: course 110. Basic physiological mechanisms involved in sensory systems. Comparative approach to considerations of mechano-sensitive systems (audition, lateral lines, touch, echo location, equilibrium), chemosensitive systems (olfaction, taste, pheromones), photosensitive systems (vision, infrared detection, UV detection), electroreception, and pain. Emphasis on receptors.

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. Fuller
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 (Chairperson 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 (Chairperson in charge)
Discussion—1 hour. Prerequisite: upper division standing in physiology or related biological science; consent of instructor. Introduction to research findings and methods in physiology. Presentation and discussion of research by faculty and students. May be repeated for credit. (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.)

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

200L. Advanced General Physiology Laboratory (4) II. 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*.

213. Principles of Electronics for Biologists (2) III. Horowitz, Scobey
Lecture—1 hour; laboratory—3 hours. Prerequisite: Physics 6A-6B-6C and Mathematics 16A-16B-16C or the equivalent. Principles of electronics applied to biological measurements. Focuses on interconnection of laboratory instruments including filters and computers. Topics covered include: RC networks; operational amplifiers; digital gates; computer interfacing; and programming.

214. Neurophysiology (4) II. Carstens
Lecture—4 hours. Prerequisite: courses 112, 111B; consent of instructor. Electrical activity of neurons and neuroeffector junctions; physiology of the nervous system as studied by its electrical activity.

215. Neurophysiology Laboratory (3) III. Horowitz, Scobey
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. Pappone
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.

†This course is in a group from which one or more may be chosen; however, to be considered as having had full exposure to advanced systemic physiology a student must take courses 112, 113, 114, 120A, 121, 121L, and 130. A student with special interests in comparative physiology may wish to select courses from the 120 series.

***219. Muscle Growth and Development** (3) II. B. Wilson, Band man (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 (Animal Science), Stabenfeldt (Reproduction) Lecture—3 hours. Prerequisite: courses 110, 110L; Biochemistry 101B; Genetics 100. Basic phenomena of sexual and asexual reproduction and comparisons of processes in a wide variety of animals; gamete formation, structure, and metabolism; fertilization; neuroendocrine mechanisms in maturation and reproductive cycles; behavioral aspects.

221. The Ruminant Stomach (3) III. Colvin Lecture—2 hours; laboratory—3 hours. Prerequisite: course 110L and Physiological Sciences 101B or Biochemistry 101B or consent of instructor. Ruminant stomach anatomy, histology, and physiology. Original literature will be emphasized. Offered in odd-numbered years.

230. Advanced Endocrinology (2) II. Moberg Lecture—2 hours. Prerequisite: course 130 or the equivalent, and graduate standing. Focus on timely topic of endocrine research. Critical review of current literature and discussion of future research strategies in the area. May be repeated for credit when different topics covered.

231. Neuroendocrinology (2) II. Woolley Lecture—1 hour; discussion—1 hour. Prerequisite: course 130 or an equivalent course in endocrinology. Neuroendocrine interactions; neural regulation of endocrine system, especially in relation to reproduction; the role of hormones in sexual differentiation of the brain and in other developmental effects on the brain. May be repeated with consent of instructor when subject matter differs substantially.

234. Neurophysiological Basis of Neurotoxicology (3) I, Woolley Lecture—2.5 hours; discussion—0.5 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 (Chairperson 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 Sciences 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 (Chairperson in charge) Seminar—1 hour. Discussion and critical evaluation of advanced topics and current trends in research. (S/U grading only.)

290C. Research Conference in Physiology (1) I, II, III. The Staff (Chairperson in charge) Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Presentation and discussion of faculty and graduate student research in physiology. May be repeated for credit. (S/U grading only.)

291A. Selected Topics in Visual Science (2) III. Chalupa (Psychology), Johnson (Ophthalmology), Scobey (Neurology), Sillman Seminar—2 hours. Prerequisite: graduate student standing and consent of instructor; course 217 recommended. Vision from the standpoint of physiology, biochemistry, morphology and psychophysics. Consideration of all levels of the visual system from periphery to highest brain centers. Emphasis on recent research. Topics vary each year. May be repeated for credit. (S/U grading only.)

291B. Seminar in Cellular Mechanisms of Adaptation (1) I, II, III. Horwitz

Discussion—0.5 hour; seminar—0.5 hour. Prerequisite: 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 (Chairperson in charge) Seminar—2 hours. Prerequisite: graduate standing in Graduate Group in Physiology or consent of instructor. Current research in Physiology. Overall design of experiments and particular research areas. (S/U grading only.)

***291E. Selected Topics in Gastrointestinal Physiology** (2) II. Mendel Lecture—1 hour; discussion—1 hour. Prerequisite: course 114 or 120C; Biochemistry 101B or Physiological Sciences 101B. In-depth coverage of selected topics in gastrointestinal physiology. Different topic covered each time course offered. May be repeated for credit. Offered in odd-numbered years.

297T. Tutoring in Physiology (3) I, II, III. The Staff (Chairperson in charge) Discussion—1 hour; tutorial—2 hours. Prerequisite: completion of course to be tutored (with a grade of A) and consent of instructor. Advanced study of systemic physiology through leading small discussion groups in upper division courses (students are required to attend lectures in the course which they are tutoring). May be repeated for credit by tutoring in different courses or in the continuation of a course (e.g., courses 112, 113, 114). (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Professional Course

300A-300B. Pedagogical Aspects of Physiology in Higher Education (3-3) I, II, III. The Staff (Chairperson in charge) Lecture, discussion, or laboratory, or combination. Prerequisite: meet qualifications for teaching assistant in physiology. Participation as a teaching assistant for one quarter in a designated physiology course. Instruction in methods of leading discussion groups, leading laboratory sections, writing and grading quizzes, operation and use of laboratory equipment, and reading and grading laboratory reports. Course meets teaching requirements for Ph.D. program in Physiology. (S/U grading only.)

Physiology (A Graduate Group)

Sarah D. Gray, Ph.D., 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)

Robert K. Webster, Ph.D., Chairperson of the Department

Department Office, 354 Hutchison Hall (752-0301)

Faculty

Richard M. Bostock, Ph.D., Associate Professor
George Bruening, Ph.D., Professor
Edward E. Butler, Ph.D., Professor
Robert N. Campbell, Ph.D., Professor
Michael R. Davis, Ph.D., Lecturer
James E. DeVay, Ph.D., Professor
John M. Duniway, Ph.D., Professor
W. Harley English, Ph.D., Professor Emeritus
Bryce W. Falk, Ph.D., Associate Professor
David G. Gilchrist, Ph.D., Associate Professor
Austin C. Goheen, Ph.D., Lecturer
Raymond G. Grogan, Ph.D., Professor Emeritus
W. Douglas Gubler, Ph.D., Lecturer
William B. Hewitt, Ph.D., Professor Emeritus
Clarence I. Kado, Ph.D., Professor
Bruce Kirkpatrick, Ph.D., Assistant Professor
Bert Lear, Ph.D., Professor Emeritus
James D. MacDonald, Ph.D., Associate Professor (*Plant Pathology, Environmental Horticulture*)
James J. Marois, Ph.D., Associate Professor
Srecko John M. Mircetich, Ph.D., Lecturer
George Nyland, Ph.D., Professor Emeritus
Joseph M. Ogawa, Ph.D., Professor
Ariana H.C. Van Bruggen, Ph.D., Visiting Assistant Professor
Robert K. Webster, Ph.D., Professor

Related Major Program. See the major in Plant Science.

Graduate Study. The Department of Plant Pathology offers programs of study and research leading to the M.S. and Ph.D. degrees. Information can be obtained from the graduate adviser. See also the Graduate Division section in this catalog.

Graduate Advisers. R.M. Bostock, J.D. MacDonald, A.H.C. Van Bruggen, B. Kirkpatrick.

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; Microbiology 2 recommended. The nature, cause, and control of plant diseases.

125. Diagnosis and Control of Plant Diseases (4) III. MacDonald Lecture—2 hours; laboratory—6 hours; field trips. Prerequisite: course 120. Clinical plant pathology with emphasis on diagnosis, epidemiology, and control of diseases of economic plants. Students may specialize in diseases of fruits, vegetables, field crops, or ornamentals in the laboratory exercises.

130. Physiology of Fungi (3) I, Gilchrist 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. Offered in odd-numbered years.

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. Van Bruggen, 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. Offered in even-numbered years.

210. Physiology and Biochemistry of Host-Pathogen Interaction (4) II, 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. Offered in odd-numbered years.

215. Genetics of Plant Pathogens (4) II, Webster

Lecture—3 hours; laboratory—3 hours. Prerequisite: course 120; Genetics 100; 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. 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, Bruening, Falk

Lecture—2 hours; laboratory—9 hours. Prerequisite: consent of instructor. Viruses as causal agents of plant diseases; chemical and physical properties of viruses; methods of transmission; procedures for assay and diagnosis; multiplication of viruses; pathological cytology and anatomy; application of equipment and techniques used in research.

228. Plant Bacteriology (5) I, Kado

Lecture—2 hours; laboratory—9 hours. Prerequisite: course 120; Microbiology 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, 151 Robbins Hall (752-7094)

Faculty. Includes ninety-six 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, 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), Yang (Vegetable Crops)
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. Uses of growth regulators in agriculture. Offered in odd-numbered years.

214. Higher Plant Cell Walls (2) I, Labavitch (Pomology), Nevins (Vegetable Crops)
Lecture—2 hours; discussion—1 hour, optional. Prerequisite: Botany 111B or the equivalent. Lectures focus on the structure, analysis, synthesis, and development-related metabolism of cell walls. Discussions center on analysis of scientific papers related to lecture topics. Offered in even-numbered years.

217. Membrane Biology of Plants (3) III, Bennett (Vegetable Crops)

Lecture—2 hours; discussion—1 hour. Prerequisite: Botany 111B and Biochemistry 101B, or consent of instructor. Structure, biogenesis, and function of plant cell membranes. Emphasis will be placed on the molecular basis of plant membrane functions and on the role of membranes in selected physiological processes. Offered in even-numbered years.

230. Plant Growth Kinematics (3) I, Silk (Land, Air and Water Resources)

Lecture—2 hours; laboratory—3 hours. Prerequisite: introductory botany, calculus, and analytic geometry. Topics include growth curves, developmental indices, growth of the plant axis, leaf expansion, phyllotaxis, growth of the apex, and environmental indices and implications for physiology.

290. Faculty Seminar (1) I. The Staff

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.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
Prerequisite: graduate standing. (S/U grading only.)

Plant Protection and Pest Management (A Graduate Group)

James J. Marois, 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. A.A. Grigarick (Entomology).

Courses in Plant Protection and Pest Management Graduate Courses

201. Concepts and Systems of Plant Protection and Pest Management (4) II, Marois (Plant Pathology)

Lecture—2 hours; discussion—1 hour; laboratory—2 hours; field experiment and data analysis. Prerequisite: Entomology 110, Plant Pathology 120, Botany 120 (may be taken concurrently), Nematology 100; Botany 117 or Zoology 125 recommended. Ecological perspectives of agricultural systems, the role of pests and pest management in these systems, and the monitoring and modeling of the systems.

202A-202B. Diagnosis of Plant Pest Problems and the Control of Causal Agents (4-4) I, Norris (Botany); III, Wilson (Entomology)

Discussion—1 hour; fieldwork—9 hours. Prerequisite: Entomology 110, Plant Pathology 120, Botany 120, Nematology 100 (may be taken concurrently). Problems and assessment of losses caused by insects, pathogens, weeds, nematodes, and other pests. Methods of determining infestation levels and establishing economic thresholds, and control of these pests with emphasis on integration of available management practices into programs.

290. Seminar (1-2) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III, summer. The Staff (Chairperson in charge) (S/U grading only.)

Plant Science

(College of Agricultural and Environmental Sciences)

Faculty

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; Land, Air and Water Resources; 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 *usual* courses taken to satisfy the requirements are shown in parentheses. Equivalent or more comprehensive courses may be taken with your adviser's approval. *Courses shown without parentheses are required.*)

Preparatory Subject Matter	UNITS
Computer science (Agricultural Science and Management 21)	59-61
English and/or Rhetoric and Communication (see College requirement)	7
English (English 102 in plant science or related area, or English 104)	1-3
Economics (Economics 1A or 1B)	5
Physics (Physics 1A-1B)	6
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)	5
Mathematics (Mathematics 16A-16B)	6
Upper-Division Subject Matter	37
Statistics (Agricultural Science and Management 150)	4
Soil science (Soil Science 100)	4
Weed science (Botany 120)	3
Entomology (Entomology 110 or 115A)	4
Plant pathology (Plant Pathology 120)	4
Plant physiology (Botany 111A, 111B)	6
Genetics (Genetics 100)	4
Water science (Water Science 104 or 110)	3-4

Plant nutrition (Botany/Plant Science 135 or Soil Science 109)	4
Depth Subject Matter	45-55
(Select one of the following eight options)	
Agronomy Option	
Specific course requirements	20-21
Agronomy 100, 100L	5
Agronomy 111, 112, 113 (any two courses)	7-8
Plant Science 101	4
Soil Science 109	4
Additional courses to be selected with consent of the adviser from the following	24-25
Agricultural Economics 130, 140, 150; Agricultural Engineering Technology 103, 104AT, 105; Agricultural Practices 49, 149; Animal Science 2, 114, 116; Atmospheric Science 105; Nematology 100, 110; Plant Pathology 125; Plant Science 102, 103, 113; Soil Science 102, 120, 150; Water Science 103, 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, 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; Agricultural Engineering Technology 114; Agronomy 100; Botany 105, 111L; Economics 11A, 11B; Environmental Horticulture 107, 115, 130; Geography 3; Landscape Architecture 40, 131, 155; Microbiology 3; Plant Pathology 125; Plant Science 101, 112, 112L, 113; Pomology 102; Psychology 144; Soil Science 109; Vegetable Crops 101; Viticulture and Enology 116A.	
Courses offered in the natural sciences may be selected in consultation with adviser.	
Landscape Horticulture Option	
Specific course requirements	30
Environmental Horticulture 6, 105, 120, 130, 133	17
Landscape Architecture 40, 131, 155	9
Plant Science 102	4
Additional courses to be selected with consent of the adviser from the following	14
Agricultural Economics 18, 112, Agronomy 100; Botany 105; Economics 11A, 11B; Environmental Horticulture 107, 115, 125; Geography 3; Landscape Architecture 111; Plant Pathology 125; Plant Science 101, 109, 113; Pomology 101; Soil Science 109; Vegetable Crops 101; Wildlife and Fisheries Biology 10.	
Courses offered in the natural sciences may be selected in consultation with adviser.	
Plant Pathology Option	
Specific course requirements	40
Biochemistry 101A, 101B	6
Botany 105, 119	10
Chemistry 1C, 5	9
Microbiology 2, 3	4
Nematology 100	4
Plant Pathology 125, 130	7
Plant Science Option	
Specific course requirements	47-50
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)	4
Soils (Soil Science 109)	4
Pomology Option	
Specific course requirements	15
Pomology 101, 102	8
Plant Science 109, 112	7
Additional courses to be selected with consent of the adviser from the following	30
Agricultural Economics 112, 140; Agricultural Engineering Technology 101AT; Agronomy 100, 100L; Atmospheric Science 105; Entomology 119, 119L; International Agricultural Development 101; Nematology 100, 110; Plant Pathology 125, 130; Plant Science 101, 102, 112, 112L, 113; Pomology 103; Soil Science 102, 109, 120, 150; Vegetable Crops 101, 118; Viticulture and Enology 116A, 116B; Water Science 111.	
Natural sciences electives, not to exceed 8 units, may also be included.	
Vegetable Crops Option	
Specific course requirements	19
Vegetable Crops 101, 105, 150	12
Plant Science 102, 112	7
Additional units selected with consent of adviser from the following	19
Agricultural Economics 130; Biochemistry 101A, 101B, 122; International Agricultural Development 110A, 110B, 141; Plant Pathology 125; Plant Science 101, 103, 112L, 113, 122, 126, 135, 170, 196; Soil Science 109; Vegetable Crops 118, 195; one unit of seminar to be selected with consent of adviser in subject matter area of specialization; 2 units of 190 or 198 or 9 units of 199 may be applied toward requirement. A Senior Thesis option is available.	
Natural sciences electives, not to exceed 8 units, may also be included.	
Viticulture Option	
Specific course requirements	30
Biochemistry 101A, 101B	6
Plant Science 101, 102, 109	12
Viticulture and Enology 3, 105, 116A, 116B	12
Additional courses to be selected with consent of the adviser from the following	15
Agricultural Economics 18, 140, 150; Agricultural Engineering Technology 101AT; Agricultural Practices 49, 149; Atmospheric Sciences 105; Biochemistry 122; Nematology 100, 110; Plant Pathology 125; Plant Physiology 208; Plant Science 103, 112, 112L, 113, 122, 202; Soil Science 102, 109, 150; Viticulture and Enology 123, 124, 125, 126, 135, 140, 217, 219; Water Science 103, 111, 172.	
Natural sciences electives, not to exceed 8 units may also be included.	
Unrestricted Electives	34-46
Total Units for the Major	180
Major Adviser. D. W. Rains (<i>Agronomy and Range Science</i>).	
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).	

NOTE: For key to footnote symbols, see page 131.

Lower Division Courses

2. Production of Cultivated Plants (5) I, Bloom (Vegetable Crops); III, The Staff (Vegetable Crops)
Lecture—2 hours; discussion—2 hours; laboratory—3 hours; V.A.S.T.—3 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 People (3) I, Hughes (Vegetable Crops)
Lecture—3 hours. Prerequisite: high school biology. Plants as a resource for food, recreation, and environmental enhancement. Emphasis on how our relationship to plants has changed through history and how the growth and development of plants affect their utility. General Education credit: Nature and Environment/Introductory.

92. Plant Science Internship (1-6) I, II, III, summer. The Staff (Rains 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 (Rains in charge)
Prerequisite: lower division standing. (P/NP grading only.)

Upper Division Courses

101. Ecology of Crop Systems (4) III. The Staff
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, photosynthetic productivity, competition, adaptation, nutrient cycling, energy relations and contemporary issues such as climate change.

102. Physiology of Cultivated Plants (4) III. Sachs (Environmental Horticulture)
Lecture—3 hours; discussion—1 hour. Prerequisite: course 2 and Botany 111B. 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) II. 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 100). 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 (Pomology)
Lecture—2 hours; discussion—1 hour; laboratory—3 hours. Prerequisite: course 2 or Botany 2. Principles and practices of propagating plants covering anatomical, physiological, and practical aspects.

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, 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. St. Clair (Vegetable Crops)
Lecture—3 hours; demonstration-discussion—2-3 hours. Prerequisite: Genetics 100 (may be taken concurrently). The principles of plant breeding applied to economic crops.

122. Physiological Genetics of Crop Plants (3) III. Jones (Vegetable Crops)
Lecture—3 hours. Prerequisite: Genetics 100; 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. Lauchli (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.

135. Mineral Nutrition of Plants (4) III. The Staff
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.)

140. Principles of Plant Biotechnology (3) II. Dandekar (Pomology)
Lecture—3 hours. Prerequisite: Biological Sciences 1 and Genetics 100. Principles and concepts of plant biotechnology including recombinant DNA technology, plant molecular biology, plant cell and tissue culture and crop improvement.

170. Reproductive Biology of Flowering Plants (2) I, Wu (Environmental Horticulture)
Lecture—2 hours. Prerequisite: Botany 111A, Genetics 100, 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. Offered in odd-numbered years.

192. Internship (1-12) I, II, III, summer. The Staff (Rains 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 post-harvest handling of fruits, nuts, vegetables, and ornamentals in California. Scheduled first two weeks immediately following last day of Spring Quarter. Considered a Spring course for pre-enrollment. (P/NP grading only.)

197T. Tutoring in Plant Science (1-4) I, II, III. The Staff
Prerequisite: upper division standing; completion of course being tutored or the equivalent. Leading discussion sections, conducting laboratory exercises or proctoring in personalized-system-of-instruction-format classes under faculty guidance. May be repeated once for credit if different course is tutored. (P/NP grading only.)

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

Graduate Courses

202. Advanced Physiology of Cultivated Plants (2) I, Sachs, Labavitch
Lecture—1 hour; discussion—1 hour. Prerequisite: courses 101 and 102; Botany 111A-111B. Selected physiological topics generally focusing on source-sink behavior affecting crop production and quality. (P/NP grading only.) Offered in even-numbered years.

216. Advanced Topics in Mineral Nutrition (4) III. Lauchli (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) III. Rappaport, Shennan (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. (Faculty of The Interdepartmental Post-harvest Biology Group)
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.

Plastic Surgery

See Medicine, School of

Political Science

(College of Letters and Science)

Randolph M. Siverson, Ph.D., Chairperson of the Department

Department Office, 227 Voorhies Hall (752-0966)

Faculty

Larry Berman, Ph.D., Professor
Edmond Costantini, Ph.D., Professor
Philip L. Dubois, Ph.D., Professor
John Freeman, M.A., Visiting Professor
Richard W. Gable, Ph.D., Professor
John B. Gates, Ph.D., Assistant 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
Joyce K. Kallgren, Ph.D., Professor
Lloyd D. Musolf, Ph.D., Professor Emeritus
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*)
Young-Kwan Yoon, Ph.D., Visiting Assistant Professor
Marvin Zetterbaum, Ph.D., Professor
Paul E. Zinner, Ph.D., Professor

The Major Programs

Political Science is the study of politics and political systems at the subnational, national, and international levels. It concerns not only the institutions of government but also the analysis of such phenomena as political behavior, political values, political change and stability, parties, pressure groups, bureaucracies, administrative behavior, justice, national security, and international affairs.

The 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 coursework 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, en-

vironmental, 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:

Preparatory Subject Matter	UNITS
Three courses from Political Science 1, 2, 3, 4, and either 5 or 7	19-20
(Course 7 may not be taken if course 5 is taken.)	11-12
Two courses from History 3, 4A, 4B, 4C, 10, 11A, 11B, 11C, 12A, 12B, 12C, 13A, 13B, 13C, 133, 134A, 134B, 145, 146A, 146B, 147A, 147B, 147C, 151A, 151B, 151C, 151D	8
Depth Subject Matter	36
Select two courses in each of three fields, listed below. The fields must be chosen from at least two Groups, A, B, or C	24
Group A	
(1) Political theory: Political Science 111-119	
Group B	
(2) American government: Political Science 100-109, 171-175, 191, 195	
(3) Parties and political behavior: Political Science 160-170	
(4) Public law: Political Science 150-159	
(5) Public administration: Political Science 180-189	
Group C	
(6) Comparative government: Political Science 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:

Preparatory Subject Matter	UNITS
One course from Political Science 1, 5, or 7	3-4
Two courses from Political Science 2, 3, or 4	8
Recommended: Economics 1A-1B.	
Depth Subject Matter	48
Core program	12
Two courses chosen from Political Science 100, 104, 105, 106, 113, 180, 181; and one course from Political Science 108, 109, 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) <i>Policy formulation:</i> Political Science 103, 105, 106, 108, 109, 160, 161, 162, 163, 164, 165, 166, 167, 168, 169, 170, 171, 173, 174, 175, 195; Economics 130.	
(2) <i>Policy implementation and evaluation:</i> Political Science 156, 180, 181, 182, 183, 187, 188, 189; Economics 131.	
(3) <i>Policy interpretation—Substance and procedures (public pre-law):</i> Political Science 151, 152, 153, 156, 157A-157B, 159.	
(4) <i>Policy areas:</i>	

- 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, Economics 123, 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:

Political Science	UNITS
<i>Plan I:</i> Upper division units in political science (may include 4 units of lower division coursework) distributed among at least two of the three Groups, A, B, and C, designated in the general Political Science major	24
<i>Plan II:</i> Upper division units in political science, with the approval of the minor adviser	24
This plan does not require a distribution of courses in any particular group inasmuch as the courses chosen will be those most appropriate to the student's academic major.	

Teacher Credential Subject Representative. Consult Departmental Office. See also the section on the Teacher Education Program.

Graduate Study. The Department offers programs of graduate study and research leading to the M.A. and Ph.D. degrees. Information concerning admission to these programs and requirements for completion are available in the department office.

Graduate Adviser. Consult Departmental Office.

Public Affairs Internship Program. This program is open to upper division students in any major who want to obtain an internship in the area of government and public service. Information and applications are available from the Intern Coordinator, Political Science Department, 226 Voorhies Hall, 752-1989.

American History and Institutions. This University requirement may be satisfied by passing any one of the following Political Science courses: 1, 5, 100, 101, 102, 103, 104, 105, 106, 108, 109, 113, 130, 131, 160, 163. (See also under University requirements.)

Courses in Political Science

Lower Division Courses

1. **American National Government** (4) I, II. Hill, Costantini
Lecture—3 hours; discussion—1 hour. Survey of American National Government, including the constitutional system, political culture, parties, elections, the Presidency, Congress, and the courts. General Education credit: Contemporary Societies/Introductory. (CAN Govt 2)
2. **Introduction to Comparative Politics** (4) II, III. Groth and staff
Lecture—3 hours; discussion—1 hour. Introduction to basic concepts in political analysis and application of them in comparative studies of selected countries. Coverage is given to cultural and other informal dimensions of politics as well as to more formal political and governmental structures. General Education credit: Contemporary Societies/Introductory.
3. **International Relations** (4) I, II, III. Jentleson and staff
Lecture—3 hours; discussion—1 hour. International conflict and cooperation, including the Cold War, nuclear weapons, and new techniques for understanding international politics.
4. **Basic Concepts in Political Theory** (4) I. Zetterbaum
Lecture—3 hours; discussion—1 hour. Analysis of such concepts as the individual, community, liberty, equality, justice, and natural law as developed in the works of the major political philosophers. General Education credit: Civilization and Culture/Introductory.

5. Contemporary Problems of the American Political System

(4) III. Berman
Lecture—3 hours; discussion—1 hour. In-depth treatment of selected problems and issues of American politics, governmental institutions, and policies.

7. The American Legal System (3) II. Fessler (Law)

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.)

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. Thompson (Afro-American Studies)
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. Thompson (Afro-American Studies)
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) III. 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. Sokolow
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) I, 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) III. 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) I. The Staff
Lecture—3 hours; research paper. The theoretical rationale for governmental activity, program evaluation, PPBS, positive theories of policy making, the quantitative study of policy determinants, implementation, and proposals for improved decision making.

109. Public Policy and the Governmental Process (4) III. Wade
Lecture—3 hours; research paper. The processes of formulating public policy, including individual and collective decision making, political exchange, competition, bargaining, coalition formation and the allocation of public goods, resources and opportunities.

111. Systematic Political Science (4) II. The Staff
Lecture-discussion—4 hours. Philosophical basis of modern political science; major specific approaches; selected concepts relevant to modern political concerns; and research design and execution.

- 112. Contemporary Democratic Theory** (4) II. Wade
Lecture—3 hours; discussion—1 hour. Major contemporary attempts to reformulate traditional democratic theory; attempts to replace traditional theory by conceptual models derived from modern social science findings. Offered in odd-numbered years.
- 113. American Political Thought** (4) III. The Staff
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 in odd-numbered years.
- 115. Medieval Political Thought** (4) III. Peterman
Lecture—3 hours; term paper. Prerequisite: course 118A. Examination of the ideas central to medieval political thinking. Emphasis will be upon the thoughts of the major political thinkers of the period, rather than upon political history.
- 116. Foundations of Political Thought: A Study in Depth of a Major Political Philosopher** (4) II. Peterman
Lecture—discussion—3 hours; term paper. Intensive analysis and evaluation of the seminal works of a major political philosopher.
- 117. Marxism** (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Examination of the political and social philosophy of Karl Marx, with reference to the evolution of Marxism in the nineteenth and twentieth centuries.
- 118A. History of Political Theory** (4) III. 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. Zetterbaum
Lecture—3 hours; special assignments. Critical analyses of the works of major political philosophers. Modern political philosophy—Machiavelli, Hobbes, Locke, Rousseau, Burke.
- 118C. History of Political Theory** (4) III. The Staff
Lecture—3 hours; term paper. Critical analyses of the works of major political philosophers. Nineteenth and twentieth centuries: Hegel, Tocqueville, Mill, Marx, Nietzsche, Sartre.
- 119. Modern Political Thought** (4) III. The Staff
Lecture—3 hours; term paper. Prerequisite: upper division standing in Political Science or consent of instructor. Study in depth of philosophers considered central to modern political thought, especially nineteenth and twentieth century political thought. Emphasis will be upon an individual philosopher or concept rather than upon a survey of modern political thought.
- 120. Theories of International Politics** (4) III. Lalman
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) III. Siverson
Lecture—3 hours; discussion—1 hour. Prerequisite: course 3 recommended. An analysis of political processes involved in the initiation, conduct, and termination of modern international warfare.
- *122. International Law** (4) 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) I, II. Yoon
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. Yoon
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 3, or consent of instructor. International communist movement; ideology organization, strategy. Relations among communist parties; problems of leadership and social composition; the Sino-Soviet conflict and its effects on revolutionary struggle. Offered in even-numbered years.
- 129. Special Studies in International Politics** (4) II. Lalman
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, II, III. Jentleson and staff
Lecture—3 hours; term paper. Prerequisite: upper division standing or consent of instructor. Broad survey of the development of U.S. foreign policy in twentieth century with emphasis on transformation of policy during and after World War II, and the introduction to analytic tools and concepts useful for understanding of current foreign policy issues.
- 131. Analysis of U.S. Foreign Policy** (4) I, III. Jentleson and staff
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) II. Zinner
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 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.
- *145. Government and Politics in Emergent Nations** (4) III. Zinner
Lecture—4 hours. Prerequisite: course 2. Conceptual study of problems of political organization and procedure in the context of rapid change engendered by social revolution in "emergent countries" and liberation from colonial oppression. Offered in 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) I, 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, socioeconomic 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 History 115B.
- *150. Jurisprudence** (4) I. 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) II. Gates
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) I, Dubois
Lecture—3 hours; discussion—1 hour. Study of the procedural and substantive meaning of the concept of "due process of law" under the U.S. Constitution. Major focus on the protections of the Bill of Rights and the Due Process Clause of the 14th Amendment in the area of criminal procedure.
- *156. Administrative Law** (4) I, Musolf
Lecture—3 hours; discussion—1 hour. 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) II. Gates
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or consent of instructor. Judicial review, jurisdiction of the federal courts, interstate and foreign commerce, and taxation.
- 157B. American Constitutional Law** (5) III. Gates
Lecture—3 hours; discussion—1 hour. 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 individual written argument is presented by each student.
- 159. Judicial Behavior** (4) III. Gates
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) II. Owens
Lecture—3 hours; discussion—1 hour. Analysis of the structured operations of the party system in the United States; party functions and organizations, nomination processes, campaigns and elections, party trends and reforms.
- *161. Comparative Political Parties** (4) III. Owens
Lecture—3 hours; discussion—1 hour. Organization, op-

eration, 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 politics. Historical and analytical treatment of group theories as applied to interest groups (especially labor, business, agriculture, science, military); to racial, ethnic, and sectional groups; to parties, public and legislative groups, bureaucracies.

164. Public Opinion (4) I. Costantini
Lecture—3 hours; discussion—1 hour. 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.** Freeman
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) III.** Wandesforde-Smith
Lecture—discussion—4 hours. Prerequisite: upper division standing. Analysis of nature and performance of political processes for making energy choices at the international, national and state levels. Emphasizes interaction of energy policy with other political goals and the ability of governmental institutions to overcome constraints on policy innovation.

***173. Community Power and Change (4) 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. Prerequisites: 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) III. 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.** Wandesforde-Smith
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.** The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing in Political Science or consent of instructor. Introduction to the development and organization of administrative institutions in the American federal system; focus on design and reorganization, and the relationship of structure to performance, at the national, subnational, and local levels.

***182. Administrative Decision Making and Public Policy (4) II.** Hill
Lecture—3 hours; special assignments. Approaches to and models of administrative decision making; techniques of substantive policy analysis; problems and developments in planning, budgeting, personnel, and administrative reform.

***183. Administrative Behavior (4) II.** Gable
Lecture—3 hours; discussion—1 hour. The implications for American public administration of evolving concepts about behavior in organizations.

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) III.** Gable
Lecture—3 hours; discussion—1 hour. Fiscal role of government in mixed economy and democratic society; politics of revenue and resource allocation; tax policy; 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
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 avail-

ability 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
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) II. Wandesforde-Smith
Seminar—4 hours. Prerequisite: consent of instructor and upper division standing. Intensive examination of one or more special problems appropriate to American politics. May be repeated once for credit when different subject matter studied.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

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) III.** Sokolow
Seminar—2 hours; field research—2 hours. Examination of research design and methodologies appropriate to field research in community-level politics and policy, with an emphasis on elite interviewing and observation. Analysis of illustrative studies. Team participation in design, execution and analysis of a field research project.

207. Environmental Public Policy (4) II. Wandesforde-Smith
Seminar—4 hours. Analysis of the interface between the world of academic reflection about ecological and environmental problems and the world of political action. Evaluation of alternative approaches to policy analysis and recommendation. Individual research, including field research, will parallel discussion of the literature.

208. Policy Analysis (4) II. Hill
Seminar—4 hours. Social science techniques applied to public policy formation and evaluation.

209. The American Political System (4) I. Wade
Seminar—4 hours. Analysis of selected theoretical and empirical issues posed by contemporary research in American government and politics.

***218. Political Theory (4) III.** Peterman
Seminar—3 hours.

***223. International Relations (4) III.** Laiman
Seminar—3 hours.

225. The International System (4) III. Laiman
Seminar—3 hours. Analysis of the international system by means of theory formulation and integration; critique of research designs; use of various techniques of data generation and analysis.

230. American Foreign Policy (4) I. Jentleson
Seminar—3 hours.

231. U.S. Political Culture and Foreign Relations (4) I. Rothchild
Seminar—3 hours. Relates U.S. political culture to formulation of foreign policy. Analyzes American ideological preferences in historical perspective, contemporary public opinion, decision-making and implementation. Concludes by examining linkages between foreign policy behavior and democratic process. Offered in odd-numbered years.

***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.

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) II. Owens
Seminar—3 hours. Survey of selected topics in American and comparative parties.

261. Political Behavior (4) III. Costantini
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. 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) II. Downs
Seminar—4 hours. Special research seminar on selected problems and issues in the study of political theory.

290C. Research in International Relations (4) II, III. Yoon, Zinner
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 Study (1-5) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

299D. Directed Reading (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Courses

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)

Adel A. Kader, Ph.D., Chairperson of the Department

Department Office, 1045 Wickson Hall (752-0123)

Faculty

James A. Beutel, M.S., Lecturer
Frederick A. Bliss, Ph.D., Professor
Royce S. Bringham, Ph.D., Professor
Dillon S. Brown, Ph.D., Professor Emeritus
Robert M. Carlson, Ph.D., Lecturer
Peter B. Catlin, Ph.D., Lecturer
Julian C. Crane, Ph.D., Professor Emeritus
Abhaya M. Dandekar, Ph.D., Assistant Professor
Theodore M. DeJong, Ph.D., Associate Professor
Louise Ferguson, Ph.D., Lecturer
Thomas M. Gradziel, Ph.D., Assistant Professor
William H. Griggs, Ph.D., Professor Emeritus
Paul E. Hansche, Ph.D., Professor
Hudson T. Hartmann, Ph.D., Professor Emeritus
Scott Johnson, Ph.D., Lecturer
Adel A. Kader, Ph.D., Professor
Dale E. Kester, Ph.D., Professor
John M. Labavitch, Ph.D., Professor
Ormund Lilleland, Ph.D., Professor Emeritus
George C. Martin, Ph.D., Professor
Gale McGranahan, Ph.D., Lecturer
Warren C. Micke, M.S., Lecturer
F. Gordon Mitchell, M.S., Lecturer
Dan E. Parfitt, Ph.D., Lecturer
Vito S. Polito, Ph.D., Associate Professor
David E. Ramos, Ph.D., Lecturer
Roger J. Romani, Ph.D., Professor
Kay Ryugo, Ph.D., Professor
Kenneth A. Shackel, Ph.D., Assistant Professor
Douglas V. Shaw, Ph.D., Assistant Professor
Noel F. Sommer, Ph.D., Lecturer
Stephen M. Southwick, Ph.D., Lecturer
Ellen G. Sutter, Ph.D., Assistant Professor
Kiyoto Urie, Ph.D., Professor Emeritus
Steven A. Weinbaum, Ph.D., Professor

Related Major Programs. See the majors in Plant Science and in Agricultural Science and Management (Plant Science option).

Related Courses. See Plant Science 109, 112, 112L, 113, 140, 196.

Graduate Study. For graduate study related to the field of pomology, see the M.S. degree program in Horticulture. See also the Graduate Division section in this catalog.

Courses in Pomology

Lower Division Courses

10. Fruit and Nut Crop Production and Utilization (3) I. Martin 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. Weinbaum, Gradziel
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. Shackel in charge

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 odd-numbered years.

107. Small Fruit Production (2) II. Shaw

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. Ramos, Southwick, Micke, Martin

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 (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. 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. Current Perspectives in Fruit Tree Physiology (3) I. Weinbaum, DeJong

Lecture—2 hours; discussion—1 hour. Prerequisite: Biochemistry 101A-101B, Botany 111A-111B or Plant Science 102; courses 101 and 102. Current advances/concepts regarding physiological bases on developmental phenomena specific to and/or characteristic of deciduous perennial fruit plants. Offered in odd-numbered years.

205. Water and Nutritional Requirements of Deciduous Fruit Crops (4) III. Carlson, Shackel

Lecture—3 hours; laboratory—1 hour; field trips. Prerequisite: Soil Science 109, Botany 111A-111B or Plant Science 102 (or the equivalent). Development and distribution of roots, irrigation and water relations, mineral nutrient status, deficiencies and excesses, symptoms, use of tissue analysis, chelates and deficiency corrections as factors in orchard management. Offered in odd-numbered years.

210. Fruit Morphology (4) III. Polito

Lecture—2 hours; 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 postharvest biology of fruits and nuts in relation to biotechnological procedures used in handling, emphasizing research needs. Offered in odd-numbered years.

220. Quantitative Genetics and Fruit Crop Improvement (3) II. Shaw

Lecture—3 hours; discussion—3 hours. Prerequisite: Genetics 105, Plant Science 113, and Agronomy 205A. Theory and application of quantitative genetic principles to the breeding, testing, and selection of horticultural crop plants. Topics include: heritability, selection using information from relatives, indirect selection, genetic correlations, multiple trait selection, inbreeding, crop stability, and field testing. Offered in odd-numbered years.

- 290. **Seminar** (1) I, II, III. The Staff (Catlin, Hansche, Parfitt irr charge)
Seminar—1 hour.
- 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.)

understanding of the whole series of related elements that constitute a wild land environment.

Preforestry Adviser. C.C. Delwiche (Land, Air and Water Resources), Hoagland Hall, 752-1511/1407.

Portuguese

See Spanish

Preforestry

(College of Agricultural and Environmental Sciences)

The Program of Study

The Davis campus of the University of California is strongly oriented toward the biological sciences and can offer a complete background in preforestry training. The professional portion of the forestry degree (generally meaning the last two years of course work plus the ten-week summer field program) is conducted by the Department of Forestry and Resource Management administrated from the Berkeley campus. The programs offered at Davis provide full preparation for admission to the Berkeley campus. To qualify for such admission, 90 quarter units of credit must be completed with a grade-point average of C or higher in the prescribed preparatory subject matter requirements.

The requirements emphasize basic sciences and mathematics as well as preparatory experience in English or rhetoric and those elective subjects of particular interest or need to the individual student. Students should consult with a Preforestry adviser early in their career in order to plan a comprehensive two-year program.

	UNITS
Preparatory Subject Matter	90
Biological sciences (Biological Sciences 1, Botany 2, and 3-4 units from Entomology 10, Genetics 10, Microbiology 2, or Plant Pathology 120)	13-14
Chemistry (Chemistry 1A, 1B, 1C)	15
Computer science (Computer Science Engineering 10, Mathematics 21A, 21B, 21C, Engineering 5, or Agricultural Science and Management 21)	6
Economics (Economics 1A or 1B and Agricultural Economics 1 or 1B)	9
Engineering (Agricultural Engineering Technology 15, Engineering 3 or Civil Engineering 10)	3
English, rhetoric or literature (English 1, and 8 additional units from lower division courses in English, rhetoric, and/or comparative literature)	12
Geology (Geology 1-1L or 50-50L)	4-5
Mathematics (Mathematics 16A, 16B)	6
Statistical methods (Statistics 13 or Agricultural Science and Management 150 with consent of instructor)	4
Additional courses (especially recommended: Geography 161, Physics 1 or 6A-6B-6C, Resource Sciences 2, Water Science 141) ..	15-18
Summer Field Program	15

The 10-week Summer Field Program (at Meadow Valley Summer Camp in Plumas County) is completed between the sophomore and junior years. Program includes three courses totaling 15 units which mark the beginning of the professional program. The course provides introduction to practical skills involved in land management, but emphasis is on concepts and principles, along with development of an

Preventive Veterinary Medicine (A Graduate Program)

_____, Director of the Program

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 Louise W. Catlin, Program Coordinator in the Department of Epidemiology and Preventive Veterinary Medicine.

Graduate Adviser. H. P. Riemann (Epidemiology and Preventive Medicine).

Psychiatry

See Medicine, School of

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., Professor
- Jarvis R. Bastian, Ph.D., Professor Emeritus
- Leo M. Chalupa, Ph.D., Professor
- Richard G. Coss, Ph.D., Professor
- William F. Dukes, Ph.D., Professor Emeritus
- Alan C. Elms, Ph.D., Professor
- Robert A. Emmons, Ph.D., Assistant Professor
- Karen P. Erickson, Ph.D., Professor
- Albert A. Harrison, Ph.D., Professor
- Kenneth R. Henry, Ph.D., Professor
- Joel T. Johnson, Ph.D., Assistant Professor
- Neal E.A. Kroll, Ph.D., Professor
- Joseph Lyons, Ph.D., Professor Emeritus
- William A. Mason, Ph.D., Professor
- Sally P. Mendoza, Ph.D., Assistant Professor
- G. Mitchell, Ph.D., Professor
- Robert M. Murphey, Ph.D., Professor
- Thomas Natsoulas, Ph.D., Professor
- Donald H. Owings, Ph.D., Professor
- Theodore E. Parks, Ph.D., Professor
- Robert B. Post, Ph.D., Assistant Professor
- Stephanie A. Shields, Ph.D., Associate Professor
- Dean K. Simonton, Ph.D., 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 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 gender, aging and maturity, environmental awareness, altered states of consciousness, and primate behavior.

Psychology

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	21-25
Psychology 1 or the equivalent	4
Psychology 41	4
Statistics 13 or 102	4
Biological Sciences 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
(Strongly recommended that Psychology 41, Statistics 13, or 102 be completed before enrolling in upper division courses.)	

Depth Subject Matter

Two courses from two of the following three groups and one course from the remaining group	20-22
Group A: Psychology 130, 131, 132, 135, 136	
Group B: Psychology 108, 129, 134, 150	
Group C: Psychology 112, 143, 145, 147, 168	
Additional units to achieve a total of 40 upper division units in psychology	18-20
(Psychology 103 strongly recommended for students who plan to do graduate work in any area of Psychology.)	

Total Units for the Major 61-65

Psychology

B.S. Major Requirements:

Biology Emphasis

	UNITS
Preparatory Subject Matter	51-54
Psychology 1 or the equivalent	4
Psychology 41	4
Statistics 13 or 102	4
Mathematics 16A-16B or 21A-21B	6-8
Physics 10	4
Biological Sciences 1, Physiology 2 or 110, 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

316 Psychology

(Strongly recommended that Psychology 41 or Statistics 13 be completed before enrolling in upper division courses.)

Depth Subject Matter	47-49
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, 143, 145, 147, 168	8
Additional units to achieve a total of 40 upper division units in psychology	8-9
Genetics 100	4
Zoology 125 or 148	3-4

Total Units for the Major (Biology Emphasis) 98-103

Recommended

Psychology 154, 180B, 199 (on a psychobiological topic), Zoology 105, 106, Anthropology 154, Environmental Studies 110. (Psychology 103 strongly recommended for students who plan to do graduate work in any area of Psychology.)

Mathematics Emphasis

Preparatory Subject Matter	44-48
Psychology 1 or the equivalent	4
Psychology 41	4
Statistics 13 or 102	4
Mathematics 21A, 21B, 21C,	12
Computer Science Engineering 30 or Engineering 5	3
Chemistry 10 or 1A-1B or 4A-4B	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
(Strongly recommended that Psychology 41 or Statistics 13 be completed before enrolling in upper division courses.)	

Depth Subject Matter	47-48
Five Psychology courses, distributed as specified:	
Group A: two courses from 130, 131, 132, 135, 136	8-9
Group B: two courses from 108, 129, 134, 150	10
Group C: one course from 112, 143, 145, 147, 168	4
Psychology 103	5
One course from Psychology 105, 206, 207	4
Additional units to achieve a total of 40 upper division units in psychology	8-9
One course sequence from Statistics 106-108, 130A-130B, 131A-131B	7-8
(Psychology 103 strongly recommended for students who plan to do graduate work in any area of Psychology.)	

Total Units for the Major (Mathematics Emphasis) 91-96

Recommended for All Majors

Psychology 103 is strongly recommended for students who plan to do graduate work in any area of psychology. It is strongly recommended that Psychology 41 or Statistics 13 be taken prior to enrolling in upper division courses.

Major Advisers. L. P. Acredolo, L. M. Chalupa, R. G. Coss, A. C. Elms, R. A. Emmons, K. P. Erickson, A. A. Harrison, K. R. Henry, J. T. Johnson, N. E. A. Kroll, W. A. Mason, S. P. Mendoza, G. Mitchell, R. M. Murphey, T. Natsoulas, D. H. Owings, 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 also the University and College requirements.

Minor Program Requirements:

Psychology	24
Psychology 1 or the equivalent	4
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, 143, 145, 147, 168

Additional units to achieve a total of 20 upper division units

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. Introduction emphasizing empirical approaches. Focus on perception, cognition, personality and social psychology, and biological aspects of behavior. Only 2 units allowed to those who have taken course 15 or 16; no credit allowed to those who have taken both courses 15 and 16.

15. Introductory Psychobiology (3) I, II, III. The Staff
Lecture—3 hours. Survey of genetic, evolutionary and physiological factors affecting behavior. Emphasis on biological and biosocial mechanisms for understanding people and their interaction with their environment. No credit allowed to students who have completed course 1. General Education credit for two-course sequence of non-GE courses (15-16) which will satisfy requirement for one GE course: Contemporary Societies/Introductory.

16. Psychology and Modern Life (3) I, II, III. The Staff
Lecture—3 hours. Personality development, interpersonal relationships, and the relevance of psychology to social processes. No credit allowed to students who have completed course 1. General Education credit for two-course sequence of non-GE courses (15-16) which will satisfy requirement for one GE course: Contemporary Societies/Introductory.

41. Research Methods in Psychology (4) I, II, III. Mitchell
Lecture—4 hours. Prerequisite: course 1 or the equivalent; completion of Statistics 13 or 102 strongly recommended. Introduction to experimental design, interviews, questionnaires, field and observational methods, reliability and statistical inference.

98. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Primarily for lower division students. (P/NP grading only.)

99. Special Study for Lower Division Students (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

103. Advanced Research Design and Data Analysis (5) I, Kroll, Johnson, Mitchell
Lecture—5 hours. Prerequisite: course 41 and either Statistics 13 or 102. Design and analysis of psychological investigations and the interpretation of quantitative data in psychology.

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, with applications in sensory, perceptual, comparative, physiological, and other areas of psychology.

108. Physiological Psychology (5) I, II, III. Chalupa, Henry, Mendoza
Lecture—4 hours; laboratory—2 hours. Prerequisite: 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.

114. Gender and Social Development (4) II. Shields
Lecture—4 hours. Prerequisite: course 1. Biological and social factors that influence when and how psychological sex-related differences will be expressed in human development. Special attention to the scientific and social rationale which underlie the study of gender.

115. Maturity and Aging (4) III. The Staff
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) II. The Staff
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, Mendoza
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, 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 (4) II. The Staff
Lecture—4 hours. Prerequisite: course 1 or the equivalent, 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, III. 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
Lecture—3 hours; term paper. Prerequisite: course 1. Introduction to human information processing, mental representation and transformation, imagery, attention, concept formation, problem solving, and computer simulation.

137. Altered States of Consciousness (4) II, III. Tart
Lecture—4 hours. Prerequisite: course 1. Characteristics, uses, and abuses of altered states of consciousness from experiential, behavioral, physiological, and methodological perspectives. Topics typically include sleep, borderline states, dreams, meditation, hypnosis, autohypnosis, marijuana intoxication, psychedelic drugs and mystical experiences.

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, Erickson
Lecture—4 hours. Prerequisite: course 1. The theories of Freud, Erikson, and other major twentieth-century approaches to personality.

149. Gender and Human Reproduction (4) II. Erickson
Lecture—4 hours. Prerequisite: course 1. The social psychology of human reproduction. Examines gender relations over the course of the individual's reproductive cycle.

150. Comparative Psychology (5) I, II, III. Mason, Owings, Mitchell
Lecture—4 hours; discussion or project—1 hour. Prerequisite: course 1 or 15 or consent of instructor. Perspectives in animal behavior: psychological, ethological, and social systems, with an emphasis on functional behavioral categories from the standpoint of adaptation and evolution.

154. Primate Psychology (4) III. Mitchell
Lecture—4 hours. Prerequisite: course 15 or 150 or an

equivalent course in biological sciences, and consent of instructor. Comparative survey of primate psychology, based primarily on laboratory experimentation in learning, communication, cognition, sensation, motivation, emotion, perception, and effects of early experience in many species of primates.

165. Introduction to Clinical Psychology (4) I, II. The Staff
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) III. 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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: courses 15-16.

180A. Research in General Experimental Psychology (4) 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) 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) II. 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) 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. (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. 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) II. 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. Simon-ton
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) Chalupa, Henry
Seminar—4 hours. Prerequisite: graduate standing in psychology and consent of instructor. A conceptual analysis of the contributions of neuroanatomy, neurophysiology and neurochemistry to an understanding of animal and human behavior.

212. Developmental Psychology (4) I, Acredolo, 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) 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) 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) II. Johnson
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and research in social psychology.

247. Personality (4) I, Erickson
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) III. Murphey
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Theory and experiment in the genetic contributions to animal and human behavior.

252. Seminar in Psychobiology (4) III. Chalupa, Owings, Mendoza
Seminar—4 hours.

263A-263B-263C. Topics in Cognitive Psychology (4) I, Acredolo, Kroll, Parks, Post, Tart

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) The Staff
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.

***275. Attitude Formation and Change** (4) III. Elms
Seminar—4 hours. Prerequisite: graduate standing in psychology or consent of instructor. Development of attitudes; theories of attitude change; relationships between attitudes and behavior.

290. Seminar (4) II, III. The Staff
Seminar—4 hours. Prerequisite: consent of instructor. Seminar devoted to a highly specific research topic in any area of basic psychology. Special topic selected for a quarter will vary depending on interests of instructor and students.

298. Group Study (1-5) 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)

Thomas G. Nyland, D.V.M., M.S., Chairperson of the Department

Department Office, 1114 Medical Science-1A
(752-0184)

Faculty

Marvin Goldman, Ph.D., Professor (*Laboratory for Energy-Related Health Research*)
William J. Hornof, D.V.M., M.S., Associate Professor
Philip D. Koblak, D.V.M., M.S., Assistant Professor
Joe P. Morgan, D.V.M., Vet. med. dr., Professor
Thomas G. Nyland, D.V.M., M.S., Associate Professor
Timothy R. O'Brien, D.V.M., Ph.D., Professor

Part-Time Clinical Faculty

Sam Silverman, D.V.M., Ph.D., Clinical Professor
James Ticer, D.V.M., Ph.D., Associate Clinical Professor

Courses in Radiological Sciences

Upper Division Courses

115. Bioenvironmental Consequences of Nuclear Technology (3) III. Goldman
Lecture—3 hours; field trips to nuclear power stations. Prerequisite: a course in biology. Biospheric implications of radio-nuclide and thermal effluents generated by nuclear technology. Hazards evaluation based on the predictions of the most sensitive physiological response. Offered in odd-numbered years. (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

269. Medical Radiobiology (3) II. Goldman
Lecture—3 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 even-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) I, 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 foot, bone and joint disease, osteochondrosis, respiratory problems, and spinal disorders. Offered every three years (next offering, Fall 1987).

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 1988).

412. Urogenital Radiography (3) III. 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, ultrasound, and nuclear medicine procedures. New procedures and current research topics. Offered every three years (next offering, Spring 1988).

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 1988).

414. Pulmonary Radiography (3) II. The 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 1989).

415. Nuclear Medicine (2) III. Hornof and staff
Lecture—2 hours. Prerequisite: a DVM 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 covered. Offered every three years (next offering, Spring 1989).

416. Principles of Radiotherapy (2) I. The 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 1989).

417. Cardiovascular Radiography (3) II. The 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 1990).

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 1990).

Radiology

See Medicine, School of

Range and Wildlands Science

See Range and Wildlands Science, below; Range and Wildlands Science (A Graduate Group); and 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	54-61
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 16A or 16A-16B recommended)	4-10
Computer science (Agricultural Science and Management 21, or Engineering 5)	3
Economics (Agricultural Economics 1, Economics 1A, or 1B)	4-5
Geology (Geology 1-1L)	4
Soil science (Soil Science 100)	4
Animal science (Animal Science 2)	3

Depth Subject Matter	50-62
Plant physiology (Botany 111A-111B)	6
Plant ecology (Plant Science 101 or Botany 117) ...	4
Meteorology (Geography 3, Atmospheric Science 105)	3
Soil science, two upper division courses	6-8
Watershed management (Water Science 141)	3
Animal nutrition (Nutrition 115)	4
Wildlife ecology or management, one upper division course in wildlife and fisheries biology, or zoology	3-4
Forage crops (Agronomy 112)	3
Range science (Range Science 92, 100, 105, 133, 134, 135, 142, 145, 150, 160, 170, 192, 198, 199)	18-27

Breadth Subject Matter	32-36
English, or English and rhetoric (see College requirement)	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

Total Units for the Major 180

Major Adviser. J. W. Menke (Agronomy and Range Science).

Advising Center for the major is located in 258 Hunt Hall.

Graduate Study. See the Graduate Division section in this catalog.

Range and Wildlands Science (A Graduate Group)

William A. Williams, Ph.D., Chairperson of the Group

Group Office, 258 Hunt Hall (752-1715)

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. C. A. Raguse (Agronomy and Range Science).

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

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.

Graduate Study. A program of study is offered leading to the M.S. degree in Range and Wildlands Science. Detailed information can be obtained from the graduate adviser and the Graduate Announcement.

Graduate Adviser. C. A. Raguse (*Agronomy and Range Science*).

Related Courses. See Agronomy 112, Nutrition 115, Resource Sciences 100, Soil Science 105, 120, 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 Course

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 and Wildland Plants (4) III. Rice Lecture—2 hours; laboratory—6 hours; two Saturday field trips. Systematics, evolution, ecology and use of plants within range and wildland ecosystems. Taxonomy and identification of range and wildland grasses, woody perennials, legumes, and forbs.

105. Field Course (2) III. Menke Lecture—10 hours total; laboratory—30 hours total (given week following end of Spring Quarter). Prerequisite: course in plant or range ecology. Field studies of rangeland vegetation as a livestock grazing resource and as wildlife habitat. Range management and improvement strategies for enhancing multiple-use carrying capacity: grazing systems, water developments, seeding of improved species, and prescribed fire. Considered a Spring Quarter course for pre-enrollment. Offered in even-numbered years.

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 Saturday 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 grass land, 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. Offered in even-numbered years.

142. Rangeland Improvements (3) II. Jones Lecture—3 hours. Prerequisite: course 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. Offered in odd-numbered years.

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) I, 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 even-numbered years.

160. Range Livestock Production (3) III. Morris, Raguse Lecture—3 hours. Prerequisite: Animal Science 2 and course 133. 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.)

170. Range Ecosystem Planning (4) I, Menke Lecture—3 hours; laboratory—3 hours; one Saturday field trip. Prerequisite: course 160/Animal Science 160 (may be taken concurrently); Agricultural Science and Management 21, Computer Science Engineering 10 or Engineering 5 recommended. Planning of rangeland management at local and regional levels, including 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 odd-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 (Department Chairperson in charge) Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Department Chairperson in charge) Prerequisite: senior standing and consent of instructor. (P/NP grading only.)

Graduate Courses

208. Computer Modeling in Range and Crop Management (3) I, Williams Lecture—2 hours; discussion—1 hour. Prerequisite: one course from Agronomy 205B, course 170; Animal Science 128, or Environmental Studies 128. Development of computer models involving dynamic simulation and optimization modes for range and crop management problems. Modeling philosophy, assumptions, implementation, validation, and experimentation emphasized. Offered in odd-numbered years.

290. Seminar in Range Science (1-2) I, Rice; III, Williams 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)

299. Research (1-12) I, II, III. The Staff (Williams in charge) (S/U grading only.)

Manfred P. Fleischer, Ph.D. (*History*)
^{3,4}Lincoln D. Hurst, Ph.D. (*Religious Studies*)
 Naomi Janowitz, Ph.D. (*Religious Studies*)
 Whalen W. Lai, Ph.D. (*Religious Studies*)
 Barbara Metcalf, Ph.D. (*History*)
 David A. Robertson, Ph.D. (*English*)
 Aram A. Yengoyan, Ph.D. (*Anthropology*)

Faculty

^{3,4}Lincoln D. Hurst, Ph.D., Assistant Professor
 Naomi Janowitz, Ph.D., Assistant Professor
 Whalen W. Lai, Ph.D., Professor
 Barbara Metcalf, Ph.D., Professor (*History*)

The Major Program

Majoring in Religious Studies provides an opportunity to explore and analyze the written and oral traditions of the world's great religions: Eastern (Hinduism, Buddhism, Taoism, Confucianism), Western Judaism, Christianity, and Islam), ancient and modern. The program takes a rigorously academic approach to the study of these religions.

In addition to studying religious thought *per se*, students in the major also study 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.

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	28
Anthropology 2	4
Religious Studies 1, 2, 21, 40	16
Religious Studies 23 or 60	4
Religious Studies 4 or 70	4
Depth Subject Matter	40
History 130A, 130B, 130C	12
Philosophy 105	4
Anthropology 124 or Sociology 146	4
Upper division courses in religious studies including 4 units each from Jewish studies, Christian studies, Oriental religions and general religious studies (Religious Studies 100, 110, 115, 150)	20
Total Units for the Major	68

Course Equivalents

The major advisers have a list of lower and upper division courses that can be substituted for courses suggested above.

Recommended

A reading knowledge of a foreign language is highly recommended. Consult major adviser for a complete list of recommended upper division courses.

Major Advisers. W.W. Lai, 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	

Religious Studies

(College of Letters and Science)

Walén W. Lai, Ph.D., Program Director

Program Office, 922 Sproul Hall (752-9932)

Committee in Charge

Paul A. Castelfranco, Ph.D. (*Botany*)
^{2,3}Richard T. Curley, Ph.D. (*Anthropology*)

Five courses chosen from Religious Studies 102, 110, 122, 124, 140, 141A or 141B or 141C, 168, 172	20
Oriental Religions emphasis	
Religious Studies 70, 168, 172; and two courses from Religious Studies 110, History 191A, 194A	20
Judaism emphasis	
Religious Studies 23, 122, 124	12
Two additional courses from Religious Studies 110, History 143, 144	8
(Religious Studies 122 and 124 may be repeated for credit in a different subject area, and the second elective can replace one of the above three courses.)	
Christian Studies emphasis	
Religious Studies 40, 102, 140, and two courses from Religious Studies 110, 141A, 141B, 141C, 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 College of Letters and Science is an excellent preparation for most seminaries and professional theological schools. A reading knowledge of a foreign language is highly recommended.

Students interested in applying for admission to a theological school should consult the Religious Studies office and make an appointment with the preministerial adviser.

Preministerial Adviser. L. D. Hurst.

Courses in Hebrew

Lower Division Courses

- Elementary Classical Hebrew (5) I.** Giller
Lecture—4 hours; discussion—1 hour. Introduction to Hebrew alphabet, basic vocabulary, orthography, morphology and syntax. Readings from the Bible.
- Elementary Classical Hebrew (5) II.** Giller
Lecture—4 hours; discussion—1 hour. Prerequisite: course 1 or consent of instructor. Hebrew alphabet, basic vocabulary, orthography, morphology and syntax. Readings from Hebrew Bible. Continuation of course 1.
- Elementary Classical Hebrew (5) III.** Giller
Lecture—4 hours; discussion—1 hour. Prerequisite: course 2 or consent of instructor. Hebrew alphabet, basic vocabulary, orthography, morphology and syntax. Readings from Hebrew Bible and from post-Biblical Hebrew texts. Continuation of course 2.

Courses in Religious Studies

Lower Division Courses

- Survey of Religion (4) I, III.** Hurst, Lai and staff
Lecture—3 hours; discussion—1 hour. Basic concepts introduced through readings of the primary religious literature. Discussion of central ideas (creation, history, law, prophecy, suffering, mysticism, asceticism, karma, reincarnation, etc.); readings from the Bible, the Koran, selections from Plato and early Buddhist writings, and other basic texts. General Education credit: Contemporary Societies/Introductory.
- Myth, Ritual, and Symbolism (4) II.** Janowitz, Metcalf
Lecture—3 hours; discussion—1 hour. Myths, rituals and religious symbols found in a variety of religious traditions including examples from ancient and contemporary religious life. Variety of religious phenomena; validity of different approaches to the study of religion. General Education credit: Contemporary Societies/Introductory.
- World Religions (4) I, Lai**
Lecture—3 hours; discussion—1 hour. Eastern religions, including Hinduism, Buddhism and Taoism from their origins to the present.
- 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.

***18. Cosmology and Culture: Interactions between Religion and Science (4) II.** Griesemer (Philosophy), Janowitz
Lecture—3 hours; discussion—1 hour. Prerequisite: one lower division course in philosophy or religious studies recommended. Interdisciplinary introduction to religious and scientific cosmologies, focusing on their interplay. Primary goal of course is to develop skills in analyzing cultural presuppositions and their fundamental role in science and religion. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any introductory GE course in philosophy or religious studies. (Same course as Philosophy 18.)

21. Old Testament (4) I, Janowitz
Lecture-discussion—4 hours. Religion of Ancient Israel from the time of Abraham to the post-exilic period, as contained in the Hebrew Bible. Emphasis on such key Biblical themes and institutions as: monotheism, revelation, law, covenant, holiness, creation, prophecy, priesthood, wisdom, and apocalypse. General Education credit: Civilization and Culture/Introductory.

23. Basic Judaism (4) III. Janowitz
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. General Education credit: Civilization and Culture/Introductory.

***60. Introduction to Islam (4) II.** Metcalf
Lecture-discussion—4 hours. Introduction to topics at core of Islamic tradition including Muhammad, the Qur'an, Islamic law, Sufism and sects as well as to selected topics including Islamic revival.

70. Introduction to Buddhism (4) I, Lai
Lecture—3 hours; term paper (30 hours minimum preparation). Lectures, readings, and discussions on the development of Buddhism in India, China, and Japan; its influence on various Far Eastern art forms.

***75. Chinese Philosophy: An Introduction (3) II.** Lai
Lecture—2 hours; discussion—1 hour. Introduction to Chinese philosophy from Classical to Modern times: emphasis on basic metaphysics and its change over time, including Confucian humanism, Taoist cosmologies, the Han synthesis of Tao, Yin-yang and Five 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.)

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.** Lai
Lecture-discussion—3 hours; term paper. Lives of selected religious leaders representative of different religious temperaments and historical traditions.

115. Mysticism (4) II. Janowitz
Lecture-discussion—4 hours. Prerequisite: one lower division Religious Studies course (except 10, 98, or 99). Course intended primarily for Religious Studies majors, with others admitted. Historical and descriptive analysis of selected mystical traditions, and of selected key figures; readings of representative mystical authors.

122. Studies in Biblical Texts (4) III. Janowitz
Lecture—3 hours; term paper. Prerequisite: course 21. Study of a book from the Prophets or writings from critical, historical, and religious perspectives. May be repeated once for credit in different subject area.

***124. Topics in Judaism (4) III.** Janowitz
Lecture—3 hours; term paper. Prerequisite: course 23. Examination of selected aspects of Jewish life, religion, or literature. May be repeated once for credit in different subject area.

***125. Talmud (4) III.** Janowitz
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.** Janowitz 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.** Janowitz 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.** Janowitz 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 to alternate with 141B, 141C. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Comparative Literature 1, Integrated Studies 2B, Philosophy 1, or Religious Studies 40.

***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 to alternate with 141A, 141C. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Comparative Literature 1, Integrated Studies 2B, Philosophy 1, or Religious Studies 40.

141C. New Testament Literature (4) III. The Staff
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 to alternate with 141A, 141B. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Comparative Literature 1, Integrated Studies 2B, Philosophy 1, or Religious Studies 40.

***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 4. Study of the religious bases to ethics through concentration on the ethical tracts of one major tradition, or through a comparison of the attitudes of two or more traditions to a common ethical issue. Offered every three years.

***168. Hinduism (4) II.** The Staff
Lecture—3 hours; term paper (30 hours minimum preparation). Prerequisite: course 4. Hindu tradition from ancient to modern times. Multiplicity of religious forms within Hinduism with mention of Jainism, Buddhism and Sikhism and their relation to the main stream of Hindu religion. Offered in even-numbered years.

172. Ch'an (Zen) Buddhism (4) II. Lai
Lecture-discussion—3 hours; term paper. Prerequisite: course 4 recommended. Doctrines and methods of the Patriarchs and great masters, both ancient and modern in the framework of the orthodox Buddhist tradition. Doctrinal basis of meditational techniques.

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.

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)

George H. Stabenfeldt, D.V.M., Ph.D.,
Chairperson of the Department

Department Office, 1126 Medical Science I (752-1358)

Faculty

David M. Baldwin, Ph.D., Associate Professor in Residence

Domenico Bernoco, D.V.M., Libera Docenza, Associate Professor

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

Bill L. Lasley, Ph.D., Professor in Residence

Irwin K. M. Liu, D.V.M., Ph.D., Professor

George H. Stabenfeldt, D.V.M., Ph.D., Professor

Clyde J. Stormont, Ph.D., Professor Emeritus

Susan S. Suarez, Ph.D., Assistant Adjunct Professor

Part-Time Clinical Faculty

Robert E. Dickerson, 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 100 (or the equivalent), or consent of instructor. Immunologic and electrophoretic techniques used in the exploration of heritable differences in red cell antigens, serum proteins and enzymes of domestic animals.

199. **Special Study for Advanced Undergraduates** (1-5) I, II, III. The Staff (Stabenfeldt 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.

*290. **Seminar** (1) I, II, III. BonDurant
Seminar—1 hour. Discussion of current topics in food animal

reproduction and medicine, as well as presentation of research findings by graduate students and faculty. (S/U grading only.)

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 (Stabenfeldt in charge)

299. **Research** (1-12) I, II, III. The Staff (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, as well as those pursuing 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. 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 selected 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 and environmental staff specialists with government agencies, municipalities and private firms. A significant proportion of graduates undertake further studies leading to advanced degrees in resources, the environment and related fields.

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	71-78
English or English and rhetoric (see College requirements)	7-8
Chemistry (Chemistry 1A, 1B)	10
Physics (Physics 1A-1B, or 6A-6B-6C for quantitative resource management emphasis)	6-12
Mathematics (Mathematics 16A, 16B)	6
Microcomputer skills (Agricultural Science and Management 21)	3
Computer programming (Agricultural Science and Management 121, Computer Science Engineering 10, 30)	3
Biology (Biological Sciences 1)	5
Animal and/or plant science	6
Atmospheric science (Atmospheric Science 60 or Geography 3)	3

NOTE: For key to footnote symbols, see page 131.

Geology or physical geography 3-4
Environmental quality (Environmental Toxicology 10) 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
Students contemplating graduate studies should include more comprehensive coursework in physics, in chemistry, and in mathematics.

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), (English 103D, 103E, 104) 3
Quantitative 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 each of three of the following areas 9
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.

Electives 23-34

Total Units for the Major 180

Related Courses. For courses that are related to this major 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, Soil Science, Water Science, Wildlife and Fisheries Biology, and Zoology.

Major Adviser. J. W. Menke (*Agronomy and Range Science*, 249A Hunt 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** (3) II. Hartsough
Lecture—2 hours; discussion—1 hour. Prerequisite: Biological Sciences 10 or Chemistry 10. Introduction to the physical, biological and ecological factors that give the forest its character and examination of social and economic factors governing forest management. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10 or Chemistry 10.

3. **Energy and the Environment** (3) I, II. Flocchini, Walker
Lecture—3 hours. Prerequisite: Biological Science 10, Chemistry 10, Physics 10 or one equivalent course. Energy resources, their global distribution and the social, economic, political and environmental factors influencing utilization. Roles of hydro, solar, biomass, geothermal, nuclear and fossil fuels in meeting California's energy requirements. General Education credit with concurrent enrollment in course

3G: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Biological Sciences 10, Chemistry 10, or Physics 10.

3G. Energy and the Environment Discussion (1) I, II. Discussion—1 hour. Prerequisite: course 3 concurrently. Critical, methodical, and analytical study of issues dealing with energy-environment interactions. General Education credit with concurrent enrollment in course 3: Nature and Environment/Non-Introductory. Recommended GE prerequisite: See course 3 above.

3L. Energy, Society and Environment Laboratory (2) I, Walker Discussion—1 hour; laboratory—3 hours; Saturday field trips. Field trips to examine nuclear, solar, fossil fuel, hydroelectric, wind, geothermal and cogeneration energy conversion facilities.

10. California: The State (3) I, III. Walker Lecture—3 hours. Prerequisite: introductory geology or geography recommended. Introduction to geomorphology, physiography and natural resources of California. Interrelated impacts of terrain, climate and resources upon essential human activities. Analysis of the fundamental concepts and methods of inquiry guiding existing resource management policies. General Education credit with concurrent enrollment in course 10G: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Geography 5-5G.

10G. California: The State (Discussion) (1) I, III. Walker Discussion—1 hour; brief essays. Prerequisite: course 10 concurrently. Small group discussion of topics assigned for course 10. Preparation and discussion of essays. General Education credit with concurrent enrollment in course 10: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: see course 10.

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. 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. Demment 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. Renewable Energy Resource (3) II. Flocchini Lecture—3 hours. Prerequisite: course 3. Characteristics of solar energy; energy balance of structures; analysis of systems for heating water and air; air conditioning systems; electricity from the sun; biomass conversion; wind power.

112. California by Air (3) III. Walker Lecture—1 hour; discussion—2 hours; laboratory—one Friday or Saturday flight; individual study projects and written and oral reports. Prerequisite: course 10 (may be taken concurrently) and one introductory course in geology or a course in physical geography. Issues in use of natural resources; social and environmental effects of using specific resources; analysis of strategies designed to assure continuation of resource availability. (\$60 laboratory fee.)

131. Air as a Resource (3) I, Flocchini Lecture—2 hours; discussion—1 hour. Prerequisite: Chemistry 10. Degradation of the atmospheric resource, historical aspects and effects of air pollution examined. Evaluation of primary gaseous and particulate pollutants and discussion of their impact. General Education credit: Nature and Environment/Non-Introductory. Recommended GE prerequisite: Chemistry 10.

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

Graduate Course

203. Solar Energy Conversion Processes (3) II. Flocchini Lecture—3 hours. Prerequisite: course 103, Mathematics 16C. Forms of solar energy; solar energy climatology; heat transfer; analysis of systems for space heating and cooling. Offered in odd-numbered years.

Rhetoric and Communication

(College of Letters and Science)

Michael T. Motley, Ph.D., Chairperson of the Department

Department Office, 224 Academic Office Building-IV (752-1221)

Faculty

Don P. Abbott, Ph.D., Associate Professor
Robert A. Bell, Ph.D., Assistant Professor
John J. Foldy, Ph.D., Lecturer
Mark P. Moore, Ph.D., Lecturer
Michael T. Motley, Ph.D., Professor
James J. Murphy, Ph.D., Professor
Ralph S. Pomeroy, Ph.D., Associate Professor
Lisa Ray, Ph.D., Lecturer
John L. Vohs, M.A., Senior Lecturer
Sally J. Widenmann, M.A., Lecturer

The Major Program

The major in Rhetoric and Communication centers on human beings as communicators, on the ways in which messages and their uses influence our lives. 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 and communication 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 and communication have found that the program has opened a broad vista of career opportunities. Some have entered the job market directly 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 and Communication

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	8
Rhetoric and Communication 1, 3	8
Depth Subject Matter	44
Rhetoric and Communication 110, 114, 115, 120 ..	16
One course from each of the following five groups	20
(a) Rhetoric and Communication 103, 105, 107	
(b) Rhetoric and Communication 111, 112, 113	
(c) Rhetoric and Communication 121, 122, 123, 125	
(d) Rhetoric and Communication 130, 134, 136, 152	
(e) Rhetoric and Communication 140, 141, 143	
Two additional upper division courses in Rhetoric and Communication	8
Total Units for the Major	52

Letter Grades

Courses to satisfy major requirements should be taken with letter grades, except for variable unit courses.

Major Adviser. L. Ray.

Minor Program Requirements:

	UNITS
Rhetoric and Communication	24
One course from Rhetoric and Communication 1, 3, 51	4
A coherent sequence of at least five upper division courses in rhetoric and communication selected with the approval of a minor adviser	20

Graduate Study. The Department of Rhetoric and Communication offers programs of study and research leading to the M.A. degree in Rhetoric and Communication. Detailed information may be obtained from the Graduate Adviser, Department of Rhetoric and Communication.

Graduate Adviser. R. A. Bell.

Courses in Rhetoric and Communication

Subject A. Students must have passed the Subject A requirement before taking any course in Rhetoric and Communication.

Lower Division Courses

1. Introduction to Public Speaking (4) I, II, III. The Staff 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)

Lecture—3 hours. Introduction to the nature and function of human communication, special reference to messages, sending, receiving, and channels.

***42. Rhetoric in the News Media** (4) II. Pomeroy Lecture-discussion—4 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.

Lecture—2 hours; discussion—2 hours; term paper. Prerequisite: upper division standing. Aspects of conducting and reporting research in rhetoric and communication. Emphasizes organization and writing style.

103. Analysis of Message Systems (4) III.

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.

Lecture—4 hours. Prerequisite: course 115. The role of language in shaping attitudes and perceptions of self and others. The use and abuse of verbal symbols in communicative situations. Concepts of meaning in discourse.

*107. Conversational Analysis (4) II.

Lecture—4 hours. Prerequisite: course 115. Examination of research studies on conversations. Methods for collecting, transcribing and recording naturally occurring conversations for analysis. Study of social impact of rule observance and nonobservance.

110. Origins of Rhetoric (4) I, III. Murphy

Lecture-discussion—4 hours. Prerequisite: course in ancient history recommended. Issues in the development of rhetoric from its origins in ancient Greece to A.D. 430. Special attention to works of Plato, Aristotle, Cicero, and Quintilian. Role of grammar and rhetoric in schools of Roman Empire. The Christian rhetoric of Saint Augustine. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: History 4A.

111. Medieval and Renaissance Rhetorical Theory (4) II. Murphy

Lecture—2 hours; discussion—2 hours. Development of the European rhetorical tradition from Saint Augustine to A.D. 1700. Attention to the three medieval rhetorical genres, the medieval university, the impact of printing, changes in Renaissance concepts of knowledge as they affected rhetoric.

*112. Early Modern Rhetorical Theory (4) II. Pomeroy

Lecture—4 hours. English and continental theories of rhetoric to 1900, with reference to developments in psychology, philosophy, and belles-lettres. Emphasis upon the works of Ward, Priestley, Campbell, Blair, and Whately.

113. Current Humanistic Trends in Rhetorical Theory (4) I, 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) II, III.

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.

115. Empirical Methods in Communication (4) I, III. Motley

Lecture—4 hours. Interpretation of formal and informal scientific reports via the logic and methods of scientific inquiry, with emphasis on experimental and descriptive research in communication.

120. Rhetorical Criticism (4) I, II, III.

Lecture—4 hours. Survey of critical methods and their use in the interpretation of rhetorical discourse.

121. Public Address in Western Culture (4) II.

Lecture-discussion—4 hours. Notable and representative speeches from antiquity to the present. Speeches are examined both as dynamic and significant events in their historical contexts, and as noted instances of rhetorical art.

*122. Public Discourse in American Culture (4)

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. 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) II. Vohs

Lecture—4 hours. Examination of current theories of group

formation, goals, structure, and leadership, as they relate to communication processes.

134. Interpersonal Communication (4) I.

Lecture—4 hours. Prerequisite: course 1, 3, or 10, or the equivalent. Communication between two individuals in social and task settings. One-to-one communication, verbal and nonverbal, in developing relationships. Consideration of theory and research on relevant variables such as shyness, self-disclosure, reciprocity, games and conflict.

136. Organizational Communication (4) II.

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) II.

Lecture—4 hours. Current issues in mass communications policy, with emphasis on the broadcast media. Examination of the economic and legal influences on media performance; the role of public broadcasting; the social impact of technological advances, including cable television and communication satellites.

*141. Mass Communication Theory and Research (4) I, The Staff

Lecture—4 hours. Prerequisite: course 115, or the equivalent course in Social Science research methods. Recent developments in the study of mass communications content and effects, with emphasis on the broadcast media. Special attention to the function of television for selected audiences; children, minorities, the aged.

142A. News Policies and Practices in Television (2) 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.

Lecture—1 hour; discussion—3 hours; one or two major writing assignments. Analysis, interpretation and evaluation of broadcast media content, employing various critical frameworks including genre studies, mythological and dramaturgical criticism, linguistic analysis, iconographic criticism, and theories of popular culture.

151. Methods of Advocacy (4) I. Pomeroy

Lecture—4 hours. Prerequisite: course 51 or consent of instructor. Study and practice of methods involved in the effective advocacy of positions on current controversial issues. Relation of inquiry and explanation to advocacy. Consideration of logical and nonlogical means of persuasion.

152. Persuasion (4) II. Bell

Lecture—4 hours. Prerequisite: course 114 or 115 recommended. Theory and research on the effectiveness of various communicative techniques used to influence the perceptions and behaviors of others. Focuses on scientific research into the processes of persuasion and resistance to persuasion in various contexts. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Sociology 2 or 3.

180. Current Topics in Rhetoric (4) II, III. The Staff

Seminar—4 hours. Prerequisite: upper division standing with a major in Rhetoric and Communication or consent of instructor. Group study of a special topic in Rhetoric and Communication. May be repeated once for credit. Enrollment limited.

192. Internship in Rhetoric and Communication (1-6) I, II, III. The Staff

Internship—3-16 hours. Prerequisite: declared major in Rhetoric and Communication and 20 units of upper division Rhetoric and Communication courses. Work-research projects, usually at off-campus sites under departmental supervision. May be repeated for credit up to 12 units. Units do not count toward major requirement. (P/NP grading only.)

194H. Senior Honors Thesis (4) I, II, III. The Staff (Chairperson in charge)

Seminar—1 hour; individual tutoring on research project—3 hours. Prerequisite: senior standing and approval by Honors Committee. Honors thesis. Directed reading, research, and writing culminating in the preparation of honors thesis under direction of faculty adviser.

197T. Tutoring in Rhetoric and Communication (2-4) I, II, III. The Staff (Chairperson in charge)

Seminar—1-2 hours; laboratory—1-2 hours. Prerequisite: upper division standing with major in Rhetoric and Communication and consent of Department Chairperson. Tutoring in undergraduate Rhetoric and Communication courses, in-

cluding leadership in small voluntary discussion groups affiliated with departmental courses. May be repeated for credit up to six units. (P/NP grading only.)

198. Directed Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

Seniors may take graduate courses with consent of instructor.

210. Contemporary Rhetorical Theory (4) II. Abbott

Lecture—4 hours. Prerequisite: upper division course in rhetorical theory/criticism or the equivalent. Rhetorical thought in the twentieth century. Processes of rhetorical invention, arrangement, style, and delivery in the works of Kenneth Burke, I.A. Richards, Richard Weaver, Chaim Perelman, and Stephen Toulmin.

212. Advances in Communication Theory (4) I, Bell

Lecture-discussion—4 hours. Prerequisite: course 114 or the equivalent. Nature and role of scientific theory in developing knowledge about communication. Examination of current communication theories.

220. Empirical Methods in Communication (4) II. Motley

Lecture—4 hours. Prerequisite: course 115 or consent of instructor. Introduction to the use of experimental and descriptive research methods in communication research. Topics include survey research, interviewing, experimental and quasiexperimental design, and statistics.

222. Practicum in Rhetorical Criticism (4) I.

Seminar—4 hours. Prerequisite: course 120, an equivalent course in criticism, or consent of instructor. Analysis of selected persuasive messages. Particular attention to the rhetorical situation and to elements in the rhetorical process.

240. Advocacy in Contemporary Society (4) III. Pomeroy

Seminar—4 hours. Prerequisite: course 151 or the equivalent. Rhetorical and communication theories of argumentation and advocative stance. Analysis of the persuasive impact of argumentation occurring in current public controversies. Offered in even-numbered years.

242. Discourse Analysis (4) II.

Seminar—4 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. Offered in even-numbered years.

243. Persuasion Theory (4) III. Bell

Lecture-seminar—4 hours. Prerequisite: course 152, 212, or consent of instructor. Major scientific theories of persuasion. Research programs related to persuasion theories.

244. Communication Processes and Problems (4) II. Vohs

Seminar—4 hours. Prerequisite: course 130, 136, or the equivalent. Theory and research on communication processes in organizations. Offered in odd-numbered years.

245. Classical Rhetorical Theory (4) Murphy

Lecture-seminar—4 hours. Prerequisite: course 110 or the equivalent. Recurrent issues in Greek and Roman rhetorical theory, particularly those in the works of Plato, Aristotle, Cicero, and Quintilian. Special attention to problems of invention and style. Frequent seminar reports involving propositions derived from readings.

247. Theories of Rhetorical Criticism (4) I.

Discussion-seminar—4 hours. Prerequisite: one course in rhetorical theory and/or criticism. Historical evolution of critical standards from the pre-Socratics to the twentieth century. Emphasis on contemporary questions of textuality, objectivity, intentionality, and justification.

*248. Rhetoric of Film (4) I.

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. Offered in odd-numbered years.

249. Interpersonal Communication Theory (4) III.

Lecture-seminar—4 hours. Prerequisite: course 134, 212, or consent of instructor. Major theories of interpersonal communication and related research.

250. Special Topics in Rhetoric (4) I.

Discussion-seminar—4 hours. Selected topics in rhetoric and communication. May be repeated for credit when a different topic is studied.

260. Communication Applications (2-4) I, II, III. The Staff (Chairperson in charge)

Discussion—1 hour; supervised field work—3-9 hours. Prerequisite: course 220. Field work in communication. Organization and implementation of a research project for a specific application of a communication program. May be repeated once for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)
Lecture—3 hours.

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

390. Teaching Communication Skills at the College Level (4) I, Motley
Lecture—2 hours; discussion—1 hour; laboratory—4 hours. Prerequisite: graduate standing or consent of instructor. Problems and techniques of teaching basic communication skills courses at the college level. (S/U grading only.)

Russian

(College of Letters and Science)

Lawrence J. Grant, M.A., Program Director
Program Office, 416 Sproul Hall (752-2114)

Committee in Charge

^{3,4}Daniel R. Brower, Jr., Ph.D. (*History*),
Chairperson

- Robert O. Crummey, Ph.D. (*History*)
- James Gallant, Ph.D. (*Russian*)
- Lawrence J. Grant, M.A. (*Russian*)
- Harriet Murav, Ph.D. (*Russian*)
- Daniel Rancour-Laferrrière, Ph.D. (*Russian*)
- Valerie A. Tumins, Ph.D. (*Russian*)

Faculty

- James Gallant, Ph.D., Associate Professor
- Lawrence J. Grant, M.A., Lecturer
- Harriet Murav, Ph.D. Assistant Professor
- Daniel Rancour-Laferrrière, 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 three emphases, depending upon career interests. The common basis for the first two is extensive training in the Russian language. The *Russian Literature* emphasis concentrates on the evaluation of Russian literary movements and cultural trends. 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 in the social or natural sciences, can lead to a career in government or business. The third area, the *Russian Area Studies* emphasis, proposes an interdisciplinary program offering training in the Russian language and literature and in the historical development and contemporary social, political, and economic conditions of the Soviet Union. It is particularly suitable for graduate work in international relations and for careers in diplomacy and in international organizations.

Russian

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	0-38
Literature/Language emphasis	
Russian 1 through 6 (or the equivalent)	0-30
Russian 41, 42	8
Recommended, Linguistics 1.	
Area Studies emphasis	
Russian 1 through 6 or the equivalent	0-30

Russian 41 or 42 or the equivalent course in basic literary analysis 4

Depth Subject Matter 36-44

Russian Literature emphasis

Russian 101A, 101B, 101C 12
 Russian 102 or 103 or 105 4
 Russian 121, 123 8
 Russian 127 or 128 4
 Additional upper division units chosen in consultation with adviser 8

Russian Language emphasis

Russian 101A, 101B, 101C 12
 Russian 102 or 105 4
 Russian 103 or 104 4
 Russian 160 4
 Additional upper division units chosen in consultation with adviser 12

Russian Area Studies emphasis

Russian 105 4
 Russian 101A, 103, or 104 4
 Russian 150 4
 Three literature courses to be chosen from
 Russian 121, 123, 126, 128, 140, 141 12
 History 137B, 137C 8
 Three courses, with no more than two in one area, to be chosen from the following two areas:
 (a) History 137A, 138, 102F;
 (b) Social sciences—Political Science 136, Economics 117, Geography 124 12
 (To meet special interest course needs, a student should obtain written approval from an adviser.)

Total Units for the Major 44-78

Major Adviser. 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 the University and College requirements.

Minor Program Requirements:

Two minor programs are available to students interested in obtaining a solid background in Russian language or literature. The Literature minor does not require a knowledge of the Russian language. Individual minor programs may be designed in consultation with the undergraduate adviser.

	UNITS
Russian	20
Russian Language emphasis	
Russian 6	4
Russian 101A, 101B, 101C	12
One course from Russian 102, 103, 104, 105, 160	4
Russian Literature emphasis	
Russian 41 or 42	4
Russian 121, 123; and 140 or 141	12
One course from Russian 120, 126, 150, 154	4
Russian Area Studies emphasis	
Three courses to be chosen from Russian 121, 123, 126, 150, 154 (Russian 41 or 42 or the equivalent course in basic literary analysis required)	12
One course from History 137B, 137C	4
One course from Political Science 136, Economics 117, Geography 124	4

Teaching Credential Subject Representative. J. Gallant. See also under Teacher Education Program.

Graduate Study. The Department offers two programs of study (one with emphasis on language and culture, the other with emphasis on literature) leading to the M.A. degree. Detailed information may be obtained by writing to the Graduate Adviser.

Graduate Adviser. H. Murav.

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 (5) I, II. Grant in charge
Discussion—5 hours; laboratory—1 hour. Introduction to Russian grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Russian 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Russian (5) II, III. Grant in charge
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 1. Continuation of grammar and language skills developed in course 1.

3. Elementary Russian (5) III. Grant in charge
Discussion—5 hours; laboratory—1 hour. Prerequisite: course 2. Continuation of grammar and language skills developed in course 2.

4. Intermediate Russian (4) I. Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 3. Grammar review and conversational practice.

5. Intermediate Russian (4) II. Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 4. Grammar review. Introduction to literature. Conversational practice.

6. Intermediate Russian (4) III. Grant and staff
Discussion—4 hours; laboratory—1 hour. Prerequisite: course 5. Grammar review. Intermediate conversation and continued reading of literature.

10. Elementary Conversation (2) I, II, III. The Staff
Discussion—2 hours. Prerequisite: course 1; course 2 or 3 (concurrently). Conversational practice to improve pronunciation and master spoken idioms. May be repeated for credit up to a maximum of 6 units.

***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. The Staff
Lecture—3 hours. Introduction to dominant literary trends, major literary figures and landmarks of Russian prose and poetry from the period of Sentimentalism through Romanticism and Realism to the beginnings of Modernism. Offered in even-numbered years.

42. Survey of Twentieth-Century Russian Literature (In English) (4) II. The Staff
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.

98. Directed Group Study (1-5) I, II, III. The Staff
Discussion—1-5 hours. (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

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 tutoring 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. The 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-Laferrrière, Murav, 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: Turgenyev, 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. Murav
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.** Rancour-Laferrrière
Lecture—3 hours; discussion—1 hour. The main works of Russian dramatists from Gogol to the present, including Turgenyev, Tolstoy, Chekhov, Gorky, Mayakovsky, Bulgakov, Shvarts. Offered in odd-numbered years.

127. Nineteenth-Century Russian Poetry (4) I. The Staff
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.** The Staff
Discussion—3 hours; term paper. Prerequisite: course 6. Introduction to principles of Russian versification followed by historical and poetic analysis of the following figures: Blyusov, Blok, Akhmatova, Mandelstam, Esenin, Mayakovsky, Khlebnikov, Pasternak, Evtushenko, Voznesensky, and Brodsky. Conducted in Russian. Offered in even-numbered years.

130. Contemporary Soviet Culture (4) III. The Staff
Lecture—3 hours; written work. Prerequisite: upper division standing or consent of instructor. Knowledge of Russian not required. Investigation of current trends in Soviet culture and the intricate relationship between artists and the government. Topics include: history of censorship, official and dissident art, recent changes in the cultural scene. Offered in even-numbered years.

131. Literature of Revolution (4) II. Murav
Lecture—3 hours; essays. Prerequisite: History 3 or 4C, and/or any introductory literature course. Study of impact of revolution on society and culture; the major artistic, political and historical works surrounding the Russian revolutions of 1905 and 1917. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: any course from the GE Literature Prerequisite List, or History 3 or 4C. Offered in odd-numbered years.

140. Dostoevsky (in English) (4) I. Murav, 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. The Staff
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 and staff
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. Rancour-Laferrrière
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) II. 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.

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Graduate Courses

***200. 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. The Staff
Discussion—3 hours; reading projects—1 hour. Examination of stylistic differences between spoken and written Russian.

210B. Style and Syntax (4) II. The Staff
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. The Staff
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," Epiphany'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 Karazin 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. Murav
Seminar—3 hours. Advanced study of the works of one or several writers or movements of the period. May be repeated for credit with consent of instructor when different topics are studied. Offered in odd-numbered years.

***223. Early Twentieth-Century Russian Literature (4) I.** Murav
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-Laferrrière
Seminar—3 hours. Analysis of selected works of Russian prose and poetry with particular emphasis on works of extraordinary literary merit or of unusual importance in the development of genres, schools, styles, techniques, and various formal elements. May be repeated for credit when different topics are studied. Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)
(S/U grading only.)

Professional Course

300. The Teaching of Russian (2) I. Grant
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
Sprout Hall (752-2114)

Faculty

Fritz Sammern-Frankeneegg, Ph.D., Lecturer
(Swedish, German)

Courses in Scandinavian

Upper Division Courses

110. Masterworks of Scandinavian Literature in Translation (4) II. Sammern-Frankeneegg
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.

111. Swedish Film as Narrative (4) III. Sammern-Frankeneegg
Lecture—3 hours; term paper. Swedish films studied as narratives in the cinematic medium and compared to their literary sources. Offered in even-numbered years.

Courses in Swedish

Lower Division Courses

1. Elementary Swedish (5) I. Sammern-Frankeneegg
Discussion—5 hours. Introduction to Swedish grammar and development of all language skills in a cultural context with special emphasis on communication. (Students who have successfully completed Swedish 2 or 3 in the 10th or higher grade in high school may receive unit credit for this course on a P/NP grading basis only. Although a passing grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Swedish (5) II. Sammern-Frankeneegg
Discussion—5 hours. Prerequisite: course 1. Continuation of course 1 in the areas of grammar and basic language skills.

3. Intermediate Swedish (5) III. Sammern-Frankeneegg
Discussion—5 hours. Prerequisite: course 2. Completion of grammar sequence and continuing practice of all language skills through cultural texts.

***4. Intermediate Swedish (4) I.** Sammern-Frankeneegg
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-Frankeneegg
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-Frankeneegg
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-Frankeneegg
Prerequisite: consent of instructor. (P/NP grading only.)

99. Special Study for Undergraduates (1-3) I, II, III. Sammern-Frankeneegg
Prerequisite: consent of instructor. (P/NP grading only.)

Sociology

(College of Letters and Science)

Gary G. Hamilton, Ph.D., Chairperson of the Department

Department Office, 135 Young Hall (752-0782)

Faculty

Nicole W. Biggart, Ph.D., Associate Professor
(*Sociology, Management*)
Lawrence E. Cohen, Ph.D., Professor
James C. Cramer, Ph.D., Associate Professor
Bruce M. Hackett, Ph.D., Associate Professor
Gary G. Hamilton, Ph.D., 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., Professor
Leon H. Mayhew, Ph.D., Professor
Dario Melossi, Ph.D., Assistant Professor
Beatriz M. Pesquera, Ph.D., Assistant Professor
(*Chicano Studies, Sociology*)
Julius A. Roth, Ph.D., Professor
John F. Scott, Ph.D., Professor
Judith Stacey, Ph.D., Associate Professor
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 process and structure of human interaction, to identify the main forces that sustain or weaken social groups, and determine the conditions that transform social life. Sociology, like any science, is a disciplined, intellectual quest for knowledge about the fundamental nature of things.

The Department of Sociology offers two major programs, Sociology and Sociology—Organizational Studies.

Students selecting the Sociology major may choose one from four options offered within this major: the General emphasis, the Law and Society emphasis, the Social Welfare emphasis, and the Comparative Studies and World Development emphasis. The *General Sociology* emphasis 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 Sociology major. These options are designed to prepare students for careers in such areas as law, corrections, social work or counseling. The *Comparative Studies and World Development* emphasis provides a sociological perspective on social and economic changes throughout the world, with a stress on relationships between "developed" and "underdeveloped" societies. It can prepare students for graduate training leading to careers in international fields. Students are encouraged to consider the Education Abroad Program for their junior year, especially one in a developing country.

The Sociology—Organizational Studies major is designed to develop a broad understanding of the political, social, and economic organizations that comprise modern society. This major emphasizes a sociological perspective, but incorporates a multidisciplinary field of study. The major introduces students to a range of theories and methods that social scientists use in the analysis of organizations. Majors in Sociology—Organizational Studies will be prepared for a variety of career options, particularly in the field of management. The major has been specifically designed to meet entry requirements for programs of professional training leading to a

Masters degree in public or private management, and may also lead to further study in any of the disciplinary areas incorporated in the major.

In addition to the above majors and options, the Department of Sociology offers several other programs and opportunities for undergraduates. These include internships, tutorships, voluntary 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 139 Young Hall.

Sociology

A.B. Degree Requirements:

General emphasis:		UNITS
Preparatory Subject Matter		25-27
Sociology 1, 46A, 46B (or the equivalent)		13
Select units from Anthropology 1, 2, Economics 1A, 1B, History 3, 4B, 4C, 17A, 17B, Philosophy 1, 12, 21, 22, 23, Political Science 1, 2, 3, 4, Psychology 1, 15		12-14
Depth Subject Matter		40
Sociology 165A, 165B		8
Select units from Sociology 126, 140, 180A, or 180B		8
At least 24 additional units in upper division sociology courses to achieve a minimum of 40 units		24
Total Units for the Major (General emphasis)		65-67
Law and Society option:		UNITS
Preparatory Subject Matter		25-27
Sociology 1, 3, 46A, 46B (or the equivalent)		17
Select units from Anthropology 1, 2, Economics 1A, 1B, History 3, 4B, 4C, 17A, 17B, Philosophy 1, 12, 21, 22, 23, Political Science 1, 2, 3, 4, Psychology 1, 15		8-10
Depth Subject Matter		40
Sociology 155		4
Select units from Sociology 120, 150, 152		8
Internship, Sociology 192A		4
Select units from Sociology 118, 122, 123, 130, 131, 139, 140, 141, 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 (or the equivalent)		17
Select units from Anthropology 1, 2, Economics 1A, 1B, History 3, 4B, 4C, 17A, 17B, Philosophy 1, 12, 21, 22, 23, Political Science 1, 2, 3, 4, Psychology 1, 15		8-10
Depth Subject Matter		40
Sociology 131, 140, 185		12
Internship, Sociology 192B		4
Select units from Afro-American Studies 100, Asian American Studies 110, 111, Native American Studies 124, 156, 171, Spanish 124, Sociology 110, 129, 169		4
Select units from Sociology 122, 127, 132, 143A or 143B, 152, 154, 156, 165B, 180A or 180B, 181		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
Comparative Studies and World Development option:		UNITS
Preparatory Subject Matter		30-57
Sociology 1, 46A, 46B		13
Economics 1A, 1B		10
Anthropology 2		4

At least one course from Geography 2, History 10, Political Science 2	3-4
Coursework in language instruction in modern foreign language equivalent to 26 units at UCD	26
Depth Subject Matter	48
Sociology 141, 145, 165A, 170	16
Economics 115A, Anthropology 126	8
At least twelve units from Sociology 118, 130, 131, 143A, 144, 156	12
Regional focus, three courses from one of the following groups	12
(a) <i>Africa/Middle East:</i> Anthropology 140A, 140B, 142, Economics 175, Geography 125A, 125B, History 115A, 115B, 115C, 116, Political Science 134, 146	
(b) <i>Latin America/Pacific:</i> Anthropology 144, 147, Geography 122A, 122B, History 161A, 161B, 162, 165, Spanish 135, 136	
(c) <i>Asia:</i> Anthropology 149, Economics 171, 172, 173, Geography 126, 127, History 193, 194A, 194B, 194C, Political Science 138, 148A, 148B, Religious Studies 168, 172, Sociology 147	
Total Units for the Major (Comparative Studies and World Development)	78-105

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 10, Mathematics 16B, 16C		
Depth Subject Matter		45
Sociology 180A, 180B		8
Sociology 103		4
Sociology 106 or the equivalent		4
(Note prerequisite: Sociology 46B or Statistics 13)		
Economics 100		5
Internship, Sociology 192C		4
Units from Applied Behavioral Sciences 162, 163, 164, 168, Agricultural Economics 112		4
Units from History 174A, 179, 187A, 187B, 194D, Anthropology 122		4
Units from Political Science 180, 181, 183, 187, 188		4
Units from Psychology 183, Rhetoric and Communication 134, 136, American Studies 125		4
Units from Sociology 118, 139, 141, 156, 159, 175, 181		4
Total Units for the Major		67

Major Advisers. Consult the Departmental Advising Office, 139 Young Hall.

Minor Program Requirements:

The Department of Sociology has established the following minor programs of study.

		UNITS
Sociology—General		20
Select units from Sociology 126, 140, 165A, 165B, 180A or 180B		8
Additional upper division units in Sociology		12
Sociology—Organizational Studies		20
Sociology 180A and 180B		8
Select units from Agricultural Economics 112, American Studies 125, Applied Behavioral Sciences 162, 163, 164, 168, Economics 100, Political Science 180, 181, 183, 188, Psychology 183, Rhetoric and Communication 134, 136		8
Select Units from Anthropology 122, History 174A, 179, 187A, 187B, 194D, Sociology 118, 139, 141, 156, 159, 175, 181		4
Sociology—Social Welfare		20
Sociology 185, plus 4 units selected from Sociology 131, 140, 152		8

Four units from Sociology 143A or 143B, 156, 165B, 180A or 180B 4
 Additional upper division units selected from Sociology 110, 122, 127, 129, 132, 154 8

Sociology—Law and Society 20
 Sociology 155, plus 4 units selected from Sociology 120, 150, 152 8
 Four units from Sociology 140, 143A or 143B, 156, 165B, 180A or 180B, 185 4
 Additional upper division units selected from Sociology 118, 122, 123, 131, 139, 141 8

Minor Advisers. Consult the Departmental Advising Office, 139 Young Hall.

Teacher Credential Subject Representative. Consult the Departmental Advising Office, 139 Young Hall. See also under 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, 139 Young Hall.

Courses in Sociology

Lower Division Courses

1. Introduction to Sociology (5) I, III. The Staff
 Lecture—4 hours; discussion—1 hour. Principles and basic concepts of sociology. The study of groups, culture, collective behavior, classes and caste, community and ecology, role, status, and personality. (CAN Soc 2)

2. Self and Society (4) I, L. Lofland; II. The Staff
 Lecture—3 hours; discussion—1 hour. Principles and basic concepts of sociological social psychology. Includes the study of: the character of the self, identity, roles, socialization, identity change, emotion and social interaction. General Education credit: Contemporary Societies/Introductory.

3. Social Problems (4) II, III. The Staff
 Lecture—3 hours; discussion—1 hour. General sociological consideration of contemporary social problems in relation to sociocultural change and programs for improvement. General Education credit: Contemporary Societies/Introductory. (CAN Soc 4)

25. Sociology of Popular Culture (4) III. The Staff
 Lecture—3 hours; discussion—1 hour. Social mechanisms that shape modern popular culture. High, folk, and mass culture: historical emergence of popular culture. Mass media, commercialization, ideology and cultural styles. Theories and methods for analyzing cultural expressions in pop music, street art, film, television and advertising. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Sociology 2 or Anthropology 2.

40. Computers and Social Research (2) III. The Staff
 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. The Staff
 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. The Staff
 Lecture—3 hours; discussion—1 hour or term paper or research project. Data-analysis techniques, measurement, scaling, multivariate analysis, and quantitative measures of association.

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

Upper Division Courses

***102. Sociology of the Environment (4) I.** Cramer
 Lecture—3 hours; discussion—1 hour or term paper or research project. 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.

103. Evaluation Research Methods (4) II. The Staff
 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 the theoretical context. Participation in an evaluation project.

106. Intermediate Social Statistics (4) I. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: course 46B or Statistics 13 or the equivalent. Intermediate level course in statistical analysis of social data, emphasizing the logic and use of statistical measures, procedures and mathematical models especially relevant to sociological analysis.

107. Seminar in Sociological Analysis (4) I. Jorgensen
 Seminar—3 hours, to be arranged—1 hour. Research and analysis using basic concepts of sociology, social organization, culture, socialization, stratification in application to specific problems. May be repeated for credit with consent of instructor. Limited enrollment.

***110. Sociology of Chicano Culture (4) II.** Pesquera
 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) I. The Staff
 Lecture—3 hours; discussion—1 hour or term paper or research project. Relation of social cleavages and social cohesion to the functioning of political institutions; the social bases of local and national power structures; social sources of political movement, analysis of concepts of alienation, revolution, ideology, ruling class, and elite.

119. War-Peace Institutions (4) II. J. Lofland
 Lecture—3 hours; discussion—1 hour or term paper or project. Comparative analysis of institutions and organizations involved in issues of international war and peace; focus on American institutions, including, on the one side, the Department of Defense and, on the other, major organizations of the peace movement. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 2.

120. Deviation and Society (4) I. The Staff
 Lecture—3 hours; discussion—1 hour or term paper or research project. Theory and studies of deviation in relation to societal reaction, group processes and social roles. Stigma and incapacity; cosmetic defect. Deviation theory applied to selected crimes, prostitution, drugs, alcohol use, and mental disorders. Creativity and society.

122. Sociology of Adolescence (4) I, II. Scott
 Lecture—3 hours; discussion—1 hour or term paper or research project. Chronological age and social status; analysis of social processes bearing upon the socialization of children and adolescents. The emergence of "youth cultures." Generational succession as a cultural problem.

123. American Society (4) I, II. Scott
 Lecture—3 hours; discussion—1 hour or term paper or research project. The demographic and social structure of American society and population, with emphasis on ethnic and class groups as bases for political and economic interest. Attention to selected current social controversies.

124. Sociology of Education (4) III. 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) II.** The Staff
 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) III. The Staff
 Lecture—3 hours; discussion—1 hour or term paper or research project. Prerequisite: course 2. Everyday interaction in natural settings; ethnographic approaches to the understanding of social meanings, situations, personal identity and human relationships. Particular attention to the work of Erving Goffman and to principles of field observation and qualitative analysis.

***127. Sociology of Death (4) III.** L. Lofland
 Lecture—3 hours; discussion—1 hour or term paper or project (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) I. 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, 10. Analysis of the influences of cultural differences and racial stratification on interpersonal interaction in instrumental settings (e.g., work, education, political action) and intimate settings (e.g., friendship, love, marriage, family). Minority/majority relationships.

129. Sociology of Black Experience in America (4) II. Jorgensen
 Lecture—3 hours; discussion, research, or term paper (determined by instructor for each offering). Survey of historical and contemporary theoretical sociological perspectives on the Black experience in United States. Emphasis on comparisons of Black sociological perspectives and mainstream perspectives of specific sociologists.

130. Race Relations (4) III. Jorgensen
 Lecture—3 hours; discussion—1 hour or term paper or research project. Functions of the social definitions of race and racial groups. Analysis of racial conflict, oppression, and other forms of ethnic stratification. Models of ethnic interaction and social change. Emphasis on racial relationships within the U.S.

131. The Family (4) II. The Staff
 Lecture—3 hours; discussion—1 hour. Contemporary family life in historical and cross-cultural perspective. How different family forms arose, their significance today and prospects for further family change. Attention to power relations within and beyond the family and to the social implications of family transformation.

132. The Sociology of Gender (4) III. 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. Offered in odd-numbered years.

***133. Sexual Stratification and Politics (4) III.** The Staff
 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) I. The Staff
 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. The Staff
 Lecture—3 hours; discussion—1 hour or term paper or research project (determined by instructor each offering). 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. Hackett
 Lecture—3 hours; discussion—1 hour or term paper or research project. Selected technological and social factors. Preconditions of economic development and industrialization. Social, political and cultural issues at various levels of economic development. Major historical differences and major current trends. Emphasis either on highly industrialized countries or on less developed countries.

142. Sociology of Transportation (4) III. Scott
 Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological factors in transportation. Consequences of transport mode development on social organization, sociological influences in transport mode choice. Transportation issues in public policy.

143A. Urban Society (4) I. L. Lofland
 Lecture—3 hours; discussion—1 hour or term paper or project (determined by instructor each offering). 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 even-numbered years.

***143B. Sociology of City Life (4) I.** L. Lofland
 Lecture—3 hours; discussion—1 hour or term paper or project

(instructor's option). Prerequisite: course 1 or the equivalent; course 143A recommended. Critical dissection of the "loss of community" issue. Analysis of the organization of primary ties in the city, of the culture of urban public life and of the learning of city skills. Offered in odd-numbered years.

144. Agriculture and Society (4) III. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Prerequisite: advanced standing in the social sciences or one year of course work in agricultural and environmental sciences. Development of agriculture as a major enterprise in modern society with the concomitant reduction in the labor force and family farms. Analysis of issues including mechanization, migrant labor, corporate farming, and public resource policy. Offered in even-numbered years.

145. Urbanization and Development (4) II. The Staff
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. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Relationship between social structures and religions. The social setting of the major world religions. Religious innovators and institutionalization (churches, sects, cults). Secularization in the modern world and the rise of secular ideologies. Offered in even-numbered years.

***147. Sociological Perspectives on East Asia (4) III.** Hamilton
Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological theories and concepts applied toward understanding East Asian society. Emphasis on the political structure, stratification and economy in China and Japan. Analysis of historical and contemporary similarities and differences. Offered in odd-numbered years.

148. Collective Behavior (4) II. The Staff
Lecture—3 hours; discussion—1 hour or term paper or project. 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) I. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological analysis of criminal behavior in relation to social structure and the criminalization process.

152. Juvenile Delinquency (4) III. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Study of juvenile delinquency in relation to the family, peer groups, community, and institutional structures. Consideration of processing of the delinquent by formal agencies of control.

154. Sociology of Health Care (4) I. Roth
Lecture—3 hours; discussion—1 hour or term paper or research project. Overview of sociological research in medicine and health care, with emphasis on the organizational, institutional and social psychological aspects.

155. Sociology of Law (4) II. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Law considered as social control; relation of legal institutions to society as affecting judicial decision making and administration of justice. Lawyers as an occupational group. Legal reform.

***156. Social Movements (4) II.** The Staff
Lecture—3 hours; discussion—1 hour or term paper or project. 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. 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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: Political Science 2 or Sociology 3.

***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) I, Roth
Lecture—3 hours; discussion—1 hour or term paper or research project. Natural history of occupations; the institutional matrix of occupations; colleague and client relationships; occupational social controls; career lines, and occupational-related self-definitions; occupational politics.

165A. Sociological Theory (4) I. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Historical introduction to sociological theory with special reference to its European origins. The development of modern sociological theory in Europe by Durkheim, Weber, Simmel, Pareto, Mosca and others.

165B. Sociological Theory (4) II. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Contemporary sociological theory with special reference to the history of American sociology and the emergence of contemporary schools of thought in the United States. Schools discussed will include functionalism, symbolic interactionism, exchange theory, and ecology.

***169. Research in the Chicano Community (4) II.** Pesquera
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. Cramer
Lecture—3 hours; discussion—1 hour or term paper or research project. Introduction to the study of human population, including theories and statistical measures; social causes and consequences of population trends; changes in population structure; geographical distribution, migration, socio-psychological factors affecting fertility.

***173. Sociology Through Literature (4) III.** The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Introduction to analysis of literature as sociological data. Reading of numerous works on American and other societies by authors such as Steinbeck, Lewis, Dreiser, Schulberg, Orwell, etc. Offered in odd-numbered years.

***175. Sociology of Mass Communication (4) II.** The Staff
Lecture—3 hours; discussion—1 hour or term paper. 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—3 hours; discussion—1 hour or term paper or research project. 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. Offered in odd-numbered years.

180A. Complex Organizations (4) II. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Prerequisite: course 1; Economics 1A and 1B recommended. Develops a sociological approach to organizations theory. Designed to introduce sociological concepts, address the alternative psychological and economic models, and involve students in the practice of organizational analysis.

180B. Complex Organizations (4) III. The Staff
Lecture—3 hours; discussion—1 hour or term paper or research project. Prerequisite: course 180A or consent of instructor. Builds on concepts and skills developed in course 180A. Deals with the issues of organizational decision making, design, and survival. Emphasis on relations between organizations and the effects of those relations in both the public and private sectors.

***181. Social Change Organizations (4) III.** J. Lofland
Lecture—3 hours; discussion—1 hour or term paper or project. Prerequisite: upper division standing or completion of course 1. Analysis of organizations with social change and improvement goals and programs, emphasizing voluntary associations and grassroots citizen groups. Topics treated include formation, decision-making and leadership, strategies and tactics, factionalism and coalitions, effectiveness.

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. Jorgensen
Lecture—3 hours; discussion—1 hour or term paper or research project. Sociological analysis of the evolution and current organization of welfare functions in modern societies.

***189. Social Science Writing (4) III.** Jorgensen
Seminar—3 hours; discussion—1 hour or term paper or research project. 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.

192A. Internship: Law and Society (1-12) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper division standing and one course from 150, 152, 155; approval of internship. Supervised internship and study in an agency, organization, or institution; application of core concepts of the Law and Society option to the work experience. May be repeated for credit. Maximum of 4 units from 192 series may be counted towards Sociology major. (P/NP grading only.)

192B. Internship: Social Welfare (1-12) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper division standing and course 185; approval of internship. Supervised internship and study in an agency, organization, or institution; application of core concepts of the Social Welfare option to the work experience. May be repeated for credit. Maximum of 4 units from 192 series may be counted towards Sociology major. (P/NP grading only.)

192C. Internship: Organizational Studies (1-12) I, II, III. The Staff
Discussion—1 hour. Prerequisite: upper division standing; course 180A or 180B; approval of internship. Supervised internship and study in an agency, organization, or institution; application of core concepts of the Organizational Studies major to the work experience. May be repeated for credit. Maximum of 4 units from 192 series may be counted towards Sociology major. (P/NP grading only.)

197T. Tutoring in Sociology (1-4) I, II, III. The Staff
Tutorial—3-12 hours. Prerequisite: upper division standing; completion of appropriate course with distinction. Activities vary depending on the nature of the course assignment. May include (but not limited to) tutoring on course material, advising on projects and papers, and leading discussion groups. (P/NP grading only.)

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

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Hamilton in charge)
Prerequisite: open to seniors only. (P/NP grading only.)

Graduate Courses

207A-207B. Methods of Quantitative Research (4-4) II-III. Cohen

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, Hamilton
Seminar—3 hours; paper. Prerequisite: consent of instructor. Open to graduate students in sociology and related disciplines. Course introduces students to topics and selected issues in the related fields of economic and political sociology and political economy.

220. Deviance, Law, and Social Control (4) I, Cohen
Seminar—3 hours. 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.** The Staff
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. Pesquera
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. Walton

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) II. 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. Walton

Seminar—3 hours; term paper or project. Prerequisite: graduate student status or familiarity with problems of developing societies. Analysis of social and economic problems of developing societies from the standpoint of theory and research on modernization and underdevelopment. Nature of third world dependency and interdependence in the global political economy. Offered in 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) I, Roth**
Seminar—3 hours; paper. Prerequisite: open to graduate students or professional students. Sociological perspectives and methods directed to health care issues. Students select topics for supervised research. The course will have a theme (described in advance) each time it is offered. Paper on research will be required. (S/U grading only.)

***255. Sociology of Law (4) III. Melossi**

Seminar—4 hours. Prerequisite: consent of instructor. Analysis of the nature of the legal process and its impact on social behavior. Will consider (1) nature and functions of law, (2) the organization and administration of law, and (3) the capacity of law to affect social behavior.

264. Proseminar in Sociology (4) I, Hackett

Seminar—3 hours. Prerequisite: limited to first year Sociology graduate students. Introduction to sociological concepts at an advanced level. Subjects include culture, social interaction, stratification, deviance, demography, collective behavior, organizations and other topics in which the department offers further specialized work. Various approaches to sociological analysis are examined.

265. Sociological Theory (4) II. Biggart

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. The Staff**

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. Biggart**

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. 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 an analytic frameworks; recording, storing, retrieving and writing up qualitative data. Emphasis on application of principles; each participant completes a field work project. (Deferred grading only, pending completion of sequence.) Offered in odd-numbered years.

298. Group Study (1-5) I, II, III. The Staff (Hamilton in charge)
Prerequisite: consent of instructor. (S/U grading only.)

299. Individual Study (1-12) I, II, III. The Staff (Hamilton 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 advanced degrees in Soil Science or Water Science or 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 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	80
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Mathematics, including calculus (Mathematics 16A, 16B), statistics, and computer programming	13
Chemistry, including Chemistry 1A-1B-1C and a more advanced course	18
Physics (Physics 6A-6B-6C)	12
Geology (Geology 50)	3
Economics or agricultural economics	3
Written expression	7
Oral expression	4
Physical sciences, biological sciences, and/or mathematics with approval of adviser	10
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	27
To supplement or expand areas of student interest selected with approval of adviser.	24
Special study or experience (192 or 199 course in the major area)	3
Unrestricted electives	21

†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 131.

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. J.W. Biggar (*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 the Graduate Division section in this catalog.

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 Soil Science, below; Soil Science (A Graduate Group); and Soil and Water Science

Soil Science

(College of Agricultural and Environmental Sciences)

Faculty

See under the Department of Land, Air and Water Resources.

Graduate Study. Programs of study leading to the M.S. and Ph.D. degrees in Soil Science are available. Information regarding these programs can be obtained from the graduate adviser and the *Graduate Announcement*. See also the *Graduate Division section in this catalog*.

Graduate Adviser. R.M. Carlson, (*Pomology*).

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, Zasoski

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

Lecture—3 hours; laboratory—3 hours. Prerequisite: Chemistry 1A-1B, Physics 1A-1B, Biological Sciences 1, and consent of instructor; Geology 50, Botany 2, Microbiology 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. 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. The Staff
Lecture—3 hours; laboratory—3 hours. Prerequisite: course 100 or the equivalent preparation in elements of soil science. Forms and availability of plant nutrient elements in soils; effects of fertilizers and soil amendments on crop and soil characteristics; conduct and interpretation of soil fertility assays.

111. Geomicrobiology (4) I. The Staff
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, Morphology and Classification (5) III. Singer
Lecture—4 hours; laboratory—3 hours (includes 5 one-day weekend field trips). Prerequisite: course 100 and Geology 1 or 2; or consent of instructor. Recognition and description of soils; chemical and physical processes of soil formation, including salt-affected soils; factors of soil formation; and introduction to soil classification with emphasis on soil taxonomy.

123. Soil Taxonomy (3) II. Huntington
Lecture—14 hours; discussion—14 hours. Prerequisite: courses 120 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. Zasoski
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)
(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
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. The Staff
Lecture—3 hours. Prerequisite: course 100; Botany 111B;

or consent of instructor. Plant needs, occurrence and reactions of water and mineral nutrients in soils; root systems and their growth in soils; mass flow and diffusion mechanisms in nutrient acquisition; models relating nutrient uptake to soil and plant characteristics; nutrient assimilation and crop quality.

211. Soil Microbiology (2) II. The Staff
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. The Staff
Lecture—2 hours; discussion—1 hour; laboratory—6 hours. Prerequisite: 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) II. Singer
Lecture—2 hours; discussion—1 hour. Prerequisite: graduate standing; courses 118, 120. Processes of soil erosion by wind and water in agricultural areas, and methods of soil conservation will be discussed. Methods of predicting rates of soil erosion will be considered. Offered in even-numbered years.

220. Pedology (3) III. Southard
Lecture—1 hour; discussion—2 hours. Prerequisite: courses 120 and 123 or the equivalent, or consent of instructor. Origin, characteristics, and uses of soils. Emphasis given to soil-forming processes, soil-geomorphic relations, and the importance of soil genesis and morphology to classification and interpretation. Offered in even-numbered years.

290. Special Topics in Soil Science (1) I, III. The Staff
Seminar—1 hour. Prerequisite: graduate standing. Oral presentation and discussion of scientific material and procedures for review and critique of publications. (S/U grading only.)

291. Current Literature in Plant Nutrition (1) I, II, III. The Staff
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)

Dennis E. Rolston, Ph.D., Chairperson of the Group

Group Office, 122 Hoagland Hall (752-1669)

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, Ph.D., Assistant Professor
Gonzalo Díaz-Migoyo, Ph.D., Professor
²Zunilda Gertel, Ph.D., Professor
Mario González, Ph.D., Lecturer
Dicier T. Jaén, Ph.D., Professor
Daniel S. Keller, Ph.D., Professor Emeritus
Almerindo E. Ojeda, Ph.D., Assistant Professor
Fabían A. Samaniego, M.A., Senior Lecturer
Antonio Sánchez-Romeralo, Ph.D., Professor
^{3,4}Robert M. Scari, Ph.D., Professor
³Máximo Torreblanca, Ph.D., Professor
Hugo J. Verani, Ph.D., Professor

Faculty

Luisa Quaresma, 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, and 28	0-33
Depth Subject Matter	45-46
Spanish 100	3
Spanish 103A-103B	8
Spanish 110A or 110B	4
Spanish 131	4
Spanish 132	3
Additional upper division units to be selected as follows:	23-24
Plan 1: Spanish Literature Emphasis	
Spanish 134	4
Spanish 104A-104B	8
Three electives in literature (at least one must be in Spanish-American literature):	12
Plan 2: Spanish-American Literature Emphasis	
Spanish 135 or 136	4
Spanish 105A-105B	8
Three electives in literature (at least two must be in Spanish-American literature):	12
Plan 3: Chicano Literature Emphasis	
Spanish 124	4
Spanish 126A-126B-126C	12
Spanish 129 or 135	4
One course from Spanish 105A-105B, 108A- 108B, 137	4

Plan 4: Spanish Language Emphasis

Spanish 133	3
Spanish 134, 135, or 136	4
Spanish 137	4
Three electives (at least one must be in literature):	
.....	12

Total Units for the Major 45-79

Major Advisers. M.E. Altisent, Díaz-Migoyo, M. González, R. M. Scari, H.J. Verani.

Minor Program Requirements:

	UNITS
Portuguese	24
Portuguese 101A or 101B	4
Portuguese 103A-103B	8
Portuguese 106	4
Portuguese 108A or 108B	4
One course from Portuguese 114, 115, 116, 117, 118	4
	UNITS
Spanish	25-27
Spanish 100	3
One course in Hispanic 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 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 also under Teacher Education Program.

The Master of Arts Degree.

The Department offers courses leading to the M.A. degree in Spanish to students who have completed with distinction the A.B. degree in Spanish, or the equivalent. Candidates will be recommended for admission to graduate studies in Spanish provided they meet the requirements of the Graduate 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. Sánchez-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 grade will be charged to the student's P/NP option, no petition is required. All other students will receive a letter grade unless a P/NP petition is filed.)

2. Elementary Portuguese (5) II. The Staff

Discussion—1 hour; laboratory—1 hour; recitation—3 hours. Prerequisite: course 1 or consent of instructor. Continuation of course 1.

3. Elementary Portuguese (5) III. The Staff

Discussion—1 hour; laboratory—1 hour; recitation—3 hours. Prerequisite: course 2 or consent of instructor. Continuation of course 2.

4. Intermediate Portuguese (5) III. The Staff

Lecture—4 hours; laboratory—1 hour. Prerequisite: course 3 or the equivalent, or consent of instructor. Readings, class discussions, and analysis of texts to enhance the students'

command of the structures and categories of Portuguese grammar.

5. Intermediate Portuguese (5) II. The Staff

Lecture—4 hours; laboratory—1 hour. Prerequisite: course 4 or the equivalent, or consent of instructor. Continuation of course 4, focusing on Luso-Brazilian narrative, drama, expository prose, and poetry. In-depth study of syntax with emphasis on the verbal tenses and moods.

Upper Division Courses**101A. Advanced Grammar and Composition in Portuguese**

(4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or the equivalent, or consent of instructor. Readings, class discussions, and written analyses of Portuguese essays and articles. Offered in even-numbered years.

101B. Advanced Grammar and Composition in Portuguese

(4) II. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or the equivalent, or consent of instructor. Readings, class discussions, and written analyses of Portuguese essays and articles. Offered in odd-numbered years.

103A. Survey of Portuguese Literature (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or the equivalent. Historical survey of the important periods of Portuguese literature: Medieval, Classic, and Baroque. Offered in even-numbered years.

103B. Survey of Portuguese Literature (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or the equivalent. Historical survey of the important periods of Portuguese literature: the nineteenth century, Romanticism, modern realism, Modernism, and Contemporary periods. Offered in odd-numbered years.

***106. Survey of Brazilian Literature (4) III. The Staff**

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or the equivalent. Colonial Period of Brazilian literature: Baroque, Romanticism, Realism, Symbolism, Modernism. Modern trends in fiction and poetry. Offered in even-numbered years.

108A. Culture and Civilization of Portugal and Brazil (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or the equivalent. Portuguese and Brazilian civilization through its social institutions, art, cinema, literature and music. Offered in even-numbered years.

108B. Culture and Civilization of Portugal and Brazil (4) II. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 5 or the equivalent. Portuguese and Brazilian civilization through its social institutions, art, cinema, literature and music. Offered in odd-numbered years.

114. Luis de Camoens (4) III. The Staff

Lecture—1 hour; discussion—3 hours. Prerequisite: course 5 or the equivalent. Lyricism of Camoens including the themes, language and style of the "redondilhas". "Medida nova" poetry. Sources, characteristics, content and meaning of the Camoens "Os Lusíadas". Offered in even-numbered years.

115. Brazilian Novel of the Twentieth Century (4) I. The Staff

Discussion—4 hours. Prerequisite: course 5 or the equivalent. Leading Brazilian novelists from the late nineteenth century to the present. Machado de Assis, Aluísio de Azevedo, Graciliano Ramos, Lins do Rego, Jorge Amado and Érico Veríssimo. Offered in even-numbered years.

116. Modern Portuguese Poetry (4) III. The Staff

Discussion—4 hours. Prerequisite: course 5 or the equivalent. The "Orpheu" group of poets with emphasis on anguish and narcissism in Mário de Sá Carneiro; Fernando Pessoa and his heteronomous creations Alberto Caetano, Alvaro de Campos and Ricardo Reis. Offered in even-numbered years.

117. Modern Brazilian Poetry (4) II. The Staff

Discussion—4 hours. Prerequisite: course 5 or the equivalent. Modernism in the poetry of Mário Andrade, Oswald de Andrade and Manuel Bandeira, considered as the leading exponents of the so-called "Movimento de 22". Offered in even-numbered years.

118. Modern Portuguese Prose Fiction (4) III. The Staff

Lecture—1 hour; discussion—3 hours. Prerequisite: course 5 or the equivalent. Neo-realism to existentialism in the twentieth century novel of Alves Redol, Gomes Ferreira, Carlos de Oliveira, Fernando Namora, Vergílio Ferreira. The original contributions of Bessa Luís. Offered in even-numbered years.

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 Spanish**Lower Division Courses**

1. Elementary Spanish (5) I, II, III. The Staff (Samaniego in charge)

Laboratory—two 1/2 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 (1-2-2) 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 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 (5) I, II, III. The Staff (Samaniego in charge)

Laboratory—two 1/2 hour sessions; recitation—5 hours. Prerequisite: course 1. Continuation of course 1.

2ATA-2ATB-2ATC. Individualized Instruction in Elementary Spanish (1-2-2) 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.

3. Intermediate Spanish (5) 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 (1-2-2) 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, II, III. The Staff (González in charge)

Recitation—3 hours. Prerequisite: course 4. Continuation of course 4.

6. Introduction to Reading (3) I, II, III. The Staff (González in charge)

Recitation—3 hours. Prerequisite: course 4; course 28 (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. Grammar and Composition for Native Speakers (4-4) I-II. Chabram

Discussion—3 hours; compositions. Prerequisite: course 3 or the equivalent, or consent of instructor. Intensive grammar review and composition. Open to students whose native language is Spanish or to those who are bilingual. Not open 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 (González 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 (González in charge)

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 (González 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 (González in charge)

Discussion—3 hours; written assignments. Prerequisite: course 5; course 6 (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. Chabram
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. Chabram
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. Altisent in charge

Lecture—3 hours. Prerequisite: course 28. 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. Armistead, Díaz-Migoyo, Sánchez-Romeralo
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. Armistead, Díaz-Migoyo, Sánchez-Romeralo
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. Altisent, Sánchez-Romeralo, Scari
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 1900. Offered in odd-numbered years.

104B. Hispanic Literature II: Modern Peninsular (4) I. Altisent, Sánchez-Romeralo, Scari
Lecture—3 hours; written reports. Prerequisite: course 100. Introduction to the study of the principal authors, works, and movements of modern Spanish literature from 1900 to the present. Offered in even-numbered years.

105A. Hispanic Literature III: Modern Spanish American (4) II. Gertel, Jaén, Verani
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 four quarters.

105B. Hispanic Literature III: Modern Spanish American (4) III. Gertel, Jaén, Verani
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.

108A. Spanish-American Prose of the Twentieth Century (4) III. Gertel, Jaén, 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. Chabram, Jaén
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. 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. Practice in creative writing, with an aim toward refinement and appreciation of written expression and expansion of vocabulary.

111. Don Quijote (4) II. Díaz-Migoyo
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 Fiction (4) I, Altisent, Díaz-Migoyo
Lecture—3 hours; term paper. Prerequisite: course 100. Study of the main literary trends and authors of the modern Spanish novel and short story. Selected works by Unamuno, Valle-Inclán, Blasco Ibañez, Cela and others will be covered.

120B. Twentieth-Century Spanish Drama (4) III. Altisent
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, Chabram
Lecture—3 hours; term paper. Prerequisite: course 28 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. Gertel, Jaén, Verani
Lecture—3 hours; term paper. Prerequisite: course 100. Study of the poetry and prose of Spanish-American Modernism (1880 to 1916). Offered in even-numbered years.

126A. Chicano Literature (4) I, Chabram
Lecture—3 hours; term paper. Prerequisite: course 100; consent of instructor. Intensive study of select topics in Chicano literature including Chicano novel. Bilingual readings. Lectures, discussions, and writing in Spanish. Offered in even-numbered years.

126B. Chicano Literature (4) II. Chabram
Lecture—3 hours; term paper. Prerequisite: course 100; consent of instructor. Intensive study of select topics in Chicano literature including Chicano theater. Bilingual readings. Lectures, discussions, and writing in Spanish. Offered in odd-numbered years.

126C. Chicano Literature (4) III. Chabram
Lecture—3 hours; term paper. Prerequisite: course 100; consent of instructor. Intensive study of select topics in Chicano literature including Chicano poetry. Bilingual readings. Lectures, discussions, and writing in Spanish. Offered in odd-numbered years.

127. Contemporary Spanish-American Poetry (4) III. Gertel, Jaén, 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. Gertel, Jaén, Verani
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, Gertel, Jaén, Verani
Lecture—3 hours; term paper. Prerequisite: course 100. Major figures in the development of the Mexican novel. Offered in odd-numbered years.

131. Modern Spanish Syntax (4) I, Ojeda
Lecture—3 hours; conferences and reports. Prerequisite: course 28. Study of word relationships in European and American Spanish, with special attention to syntax of verbs.

132. Introduction to Spanish Linguistics (3) III. Ojeda, Torreblanca
Lecture—3 hours. Prerequisite: course 28. Principles of classical phonemics and morphemics together with more recent developments; descriptive analysis of modern Spanish sounds and forms. Theoretical and practical comparison with English and other Romance Languages.

133. Spanish Phonetics (3) I, II. Torreblanca
Lecture—3 hours. Prerequisite: course 28. 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. Offered in even-numbered years.

135. Survey of Mexican Culture (4) II. Chabram
Lecture—3 hours; paper. Prerequisite: course 28. Offered in even-numbered years.

136. Survey of Spanish-American Culture (4) II, III. Gertel, Jaén, Verani
Lecture—3 hours; term paper. Prerequisite: course 28. 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. Ojeda, Torreblanca
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. Gertel, Jaén, Verani
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. Gertel, Jaén, Verani
Lecture—3 hours; term paper. 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. General Education credit: Civilization and Culture/Non-Introductory. Recommended GE prerequisite: Comparative Literature 1, 2, or 3.

150. Masterpieces of Spanish Literature (4) I, Armistead, 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.

192. Internship in Spanish (1-4) I, II, III. The Staff (Chairperson in charge)
Field work. Prerequisite: course 28; junior standing; major in Spanish, Chicano Studies, or a related field. Internships in fields where Spanish language skills can be used and perfected (teaching, counseling, translating-interpreting, 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. Díaz-Migoyo, Gertel, 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, Gertel, Sánchez-Romeralo
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-Romero
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-Romero
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. Diaz-Migoyo
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. Diaz-Migoyo
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-Romero
Seminar—3 hours. Offered in odd-numbered years.

232. Cervantes (4) I. Diaz-Migoyo
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-Romero
Seminar—3 hours. From 1898 up to the Generation of 1927.

234B. Twentieth-Century Spanish Poetry (4) II. Sánchez-Romero
Seminar—3 hours. New trends in Spanish poetry from 1927 to the present.

235A. Twentieth-Century Spanish Novel (1900-1936) (4) I. Altisent
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of the modern Spanish novel until the Civil War. Emphasis on Modernism, Generation of 1898, Vanguardism, and other literary trends through selected works by Valle-Inclán, Baroja, Unamuno, Azorín, Gomez de la Serna, and others. Offered in odd-numbered years.

235B. Twentieth-Century Spanish Novel (4) II. Altisent
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of the main narrative trends in the contemporary Spanish novel through discussion of works by Cela, Goytisolo, Martín Santos, Sánchez Ferlosio, Benet and/or others. Offered in even-numbered years.

236. Twentieth-Century Spanish Thinkers (4) III. Scari
Seminar—3 hours. Major thinkers from Ganimet 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. Altisent
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Study of the main literary trends and authors of the modern Spanish drama. Dramatists like Valle-Inclán, Lorca, Buero Vallejo, Arrabal, Nieva and others will be covered. Offered in even-numbered years.

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. Gertel
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. Gertel, 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. Gertel, 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. Gertel, Jaén
Seminar—3 hours. Prerequisite: graduate standing or consent of instructor. Emphasis on twentieth-century Mexican novel from Azuela, Yáñez, Rulfo, Fuentes to the present. Offered in odd-numbered years.

243. Spanish-American Short Story (4) III. Gertel, Jaén, Verani
Seminar—3 hours. Works by major writers, with emphasis on twentieth-century authors such as Quiroga, Borges, García Márquez, Cortázar, and Rulfo.

245. Dario and Modernism (4) I. Gertel, 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. Gertel, Verani
Seminar—3 hours. Offered in even-numbered years.

248. The Spanish-American Essay (4) II. Gertel, Jaén
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 (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only)

Professional Courses

300. The Teaching of Spanish (3) III. Samaniego
Lecture—3 hours. Prerequisite: senior or graduate standing; a major or minor in Spanish.

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.

Speech

See Rhetoric and Communication

Statistics

(Intercollege Division)

George G. Roussas, Ph.D., Chairperson of the Division and Associate Dean of Statistics
Division Office, 469 Kerr Hall (752-2361)

Faculty
P.K. Bhattacharya, Ph.D., Professor
Prabir Burman, Ph.D., Assistant Professor
Alan P. Fenech, Ph.D., Associate Professor
Wesley O. Johnson, Ph.D., Associate Professor
Y.P. Mack, Ph.D., Associate Professor
Hans-Georg Mueller, Ph.D., Associate Professor
George G. Roussas, Ph.D., Professor
Francisco J. Samaniego, Ph.D., Professor
Robert H. Shumway, Ph.D., Professor
Jessica M. Utts, Ph.D., Associate Professor
Jane-Ling Wang, Ph.D., Associate Professor
Alvin D. Wiggins, Ph.D., 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 background 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. 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 applications 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 30 or Engineering 5

Statistics 32

In addition, due to space limitation in the B.S. major, students admitted to this major will normally be chosen from those having at least a 3.0 grade-point average in the above courses. For further information, please contact a Statistics adviser.

Statistics

A.B. Major Requirements:

	UNITS
Preparatory Subject Matter	24-25
Calculus, Mathematics 21A, 21B, 21C	12
Linear algebra, differential equations, Mathematics 22A, 22B	6
Computer science, Computer Science Engineering 30 or Engineering 5 (or the equivalent)	3-4
Statistics through computers, Statistics 32	3
Depth Subject Matter	38-39
Analysis of variance, multiple regression, Statistics 106, 108 or the equivalent	8
Probability and mathematical statistics, Statistics 131A, 131B, 131C	12
Three Statistics courses with Statistics 131B as a prerequisite	9-10
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	62-64

Statistics

B.S. Major Requirements:

(Options: Statistics—general; Statistics—Computer Science)

	UNITS
Preparatory Subject Matter	24-31
Calculus, Mathematics 21A, 21B, 21C	12
Linear algebra; differential equations, Mathematics 22A, 22B	6
Computer science: General option	3-4
Computer Science Engineering 30 or Engineering 5 (or the equivalent)	

Computer Science option	10
Computer Science Engineering 30 and 40 and Electrical and Computer Science Engineering 70	
Statistics through computers, Statistics 32	3

Statistics (general) option

Depth Subject Matter	51-54
Analysis of variance, multiple regression, Statistics 106, 108 or the equivalent	8
Introduction to probability, mathematical statistics, Statistics 131A, 131B, 131C or the equivalent	12
Four Statistics courses having Statistics 131B as a prerequisite	12-13
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.)	10-12
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) **75-85**

Computer Science option

Depth Subject Matter	49-53
Analysis of variance, multiple regression, Statistics 106, 108 (or the equivalent)	8
Introduction to probability, mathematical statistics, Statistics 131A, 131B, 131C	12
Two courses having Statistics 131B as a prerequisite	6-7
Statistical computing, Statistics 141	3
Operating systems and System programming, Computer Science Engineering 150	4
Data structures, Computer Science Engineering 110	4
Data base systems, Computer Science Engineering 165 or Mathematics 160	3-4
Mathematics, two courses from Mathematics 128A, 128B, 132A, 132B, 167, 168	6-8
Computer Science Engineering 122, or Computer Science Engineering 175	3

Total Units for the Major
(Computer Science option) **73-84**

Major Adviser. W.O. Johnson.

Students are encouraged to meet with an adviser to plan a program as early as possible. Sometime before or during the first quarter of the junior year students planning to major in Statistics should consult with a faculty adviser to plan the remainder of their undergraduate programs.

Minor Program Requirements:

The Division offers a minor program in Statistics that consists of a survey at the upper division level of the fundamentals of mathematical statistics and of the most widely used applied statistical methods.

	UNITS
Statistics	19-20
Statistics 106, 108, and 130A-130B or 131A- 131B	16
One course in Statistics having Statistics 130B or 131B as a prerequisite	3-4
Preparation: Statistics 13 or 32.	

Graduate Study. The Graduate Group in Statistics offers study and research leading to the M.S. and Ph.D. degrees in Statistics. Detailed information concerning these degree programs, as well as information on admissions and on financial support, is available from the Division of Statistics.

Graduate Adviser. P.K. Bhattacharya.

Statistical Consulting. The Division provides a consulting service for researchers on campus. For more information, call the Statistical Laboratory Office (752-6096).

Courses in Statistics

Lower Division Courses

12. Introduction to Discrete Probability (3) I. The Staff
Lecture—3 hours. Prerequisite: two years of high school algebra. Random experiments; countable sample spaces; elementary probability axioms; counting formulas; conditional probability; independence; Bayes theorem; expectation; gambling problems; binomial, hypergeometric, Poisson, geometric, negative binomial and multinomial models; limiting distributions; Markov chains. Applications in the social, biological and engineering sciences. Offered in even-numbered years.

13. Elementary Statistics (4) I, II, III. The Staff
Lecture—4 hours. Prerequisite: two years of high school algebra. Measures of central tendency and dispersion; binomial, normal, Student-t, and chi-square distributions; testing hypotheses; nonparametric statistics; regression and correlation theory. (Students having had courses 130A or 131A may not receive credit for Statistics 13.)

32. Basic Statistical Analysis Through Computers (3) II. The Staff
Lecture—3 hours. Prerequisite: Mathematics 16B or 21B; ability to program in a high-level computer language such as Pascal. Overview of probability modeling and statistical inference. Problem solution through mathematical analysis and computer simulation. Recommended as alternative to course 13 for students with some knowledge of calculus and computer programming.

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

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 non parametric 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 (4) I, III. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: course 13, 32 or 102. Simple linear regression, variable selection techniques, stepwise regression, analysis of covariance, influence measures, computing packages.

110. Applied Statistical Methods: Multivariate Analysis (3) 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 non-majors. Concepts of probability and sampling, principles of estimation, properties of estimators, sampling distributions, bivariate normal and principles of testing.

131A. Introduction to Probability Theory (4) I. The Staff
Lecture—3 hours; discussion—1 hour. Prerequisite: Mathematics 22A. Fundamental concepts of probability theory, discrete and continuous random variables, standard distri-

butions, 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.

132. Engineering Statistics (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: upper division standing; a course from courses 130A, 131A, Engineering 118, or Mathematics 131. Not open to Statistics majors. Statistical estimation, hypotheses testing, correlation, simple linear regression, least squares estimation, confidence intervals, prediction intervals, multiple regression, goodness-of-fit, analysis of variance, factorial design, contingency tables, chi-square tests, applications to engineering problems.

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 (4) I. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: courses 130B and 131B or 106 and 108. Varieties of categorical data, cross-classifications, contingency tables, tests for independence. Multidimensional tables and log-linear models, maximum likelihood estimation; tests of goodness of fit. Logit models, linear logistic models. Analysis of incomplete tables. Packaged computer programs, analysis of real data.

141. Statistical Computing (3) II. The Staff

Lecture—3 hours. Prerequisite: course 130A or 131A or the equivalent; one course from Computer Science Engineering 30 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.

143. Survival Analysis (4) III. The Staff

Lecture—3 hours; discussion—1 hour. Prerequisite: course 130B, or 131C (may be taken concurrently). Statistical methods for failure time data, assessing risk of failure, parametric and nonparametric estimates of probabilities for time to failure, packaged computer programs, applications to medical and life data. Selected topics from model selection, accelerated failure time models, Cox models, nonparametric methods. Offered in even-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.

145. Bayesian Statistical Inference (3) III. The Staff

Lecture—3 hours. Prerequisite: courses 130A-130B or 131A-131B-131C or the equivalent. Subjective probability, Bayes Theorem, conjugate priors, non-informative priors, decision theory, estimation, testing, prediction, empirical Bayes methods, Bayesian robustness, properties of Bayesian procedures, comparisons with classical procedures, approximation techniques, hierarchical Bayesian analysis, applications. Offered in 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. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

Graduate Courses

205. Statistical Methods for Research (3) III. The Staff

Lecture—3 hours. Prerequisite: course 106 or 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.

235A-235B-235C. Probability Theory (3) I, II, III.

Lecture—3 hours. Prerequisite: Mathematics 127C and courses 131A-131B or the equivalent. Measure theoretic foundations, abstract integration, modes of convergence, limit theorems, independence, laws of large numbers, characteristic functions, central limit theorem, conditional expectations; topics from discrete time, Markov and stationary processes, ergodic theory, Brownian motion, weak convergence, Wiener and Poisson processes. Offered in even-numbered years. (Same course as Mathematics 235A-235B-235C.)

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, continuous 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)

299. Individual Study (1-12) I, II, III. The Staff (Chairperson in charge)

Prerequisite: consent of instructor. (S/U grading only.)

299D. Dissertation Research (1-12) I, II, III. The Staff

Prerequisite: candidate for Ph.D. degree. Research in statistics under the supervision of major professor. (S/U grading only.)

Professional Course

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)

George G. Roussas, Ph.D., Chairperson of the Group

Group Office, 469 Kerr Hall (752-2361)

Faculty. The Group has approximately twenty-five faculty members from all colleges, schools, and divisions, including eleven 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 Adviser. R.H. Shurway.

Subject A

See under University Requirements, and English A.

Surgery

See Surgery (Medicine, School of); and Surgery (Veterinary Medicine), 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., Associate Professor
 Roy W. Bellhorn, D.V.M., M.S., Professor
 Eugene M. Breznock, D.V.M., Ph.D., Professor
 Nedim C. Buyukmihci, V.M.D., Associate 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., Associate Professor
 Terrell A. Holliday, D.V.M., Ph.D., Professor
 Janet E. Ilkiw, B.V.Sc., Assistant Professor
 David N. Krag, M.D., Ph.D., Assistant Professor in Residence
 Robert L. Leighton, V.M.D., Professor Emeritus
 Robert L. Linford, D.V.M., Ph.D., Assistant Professor
 Bruce R. Madewell, V.M.D., M.S., Professor
 Dennis M. Meagher, D.V.M., Ph.D., Professor
 Harold R. Parker, D.V.M., Ph.D., Professor Emeritus
 John R. Pascoe, B.V.Sc., Ph.D., Assistant Professor
 Eugene P. Steffey, V.M.D., Ph.D., Professor
 Gordon H. Theilen, D.V.M., Professor
 Philip B. Vasseur, D.V.M., Associate Professor
 John D. Wheat, D.V.M., Professor
 Alida P. Wind, M.V.D., Senior Lecturer

Part-Time Clinical Faculty

Gregory L. Ferraro, D.V.M., Associate Clinical Professor
 Barbara E. Kitchell, D.V.M., Assistant Clinical Professor
 Charles T. Robinson, D.V.M., Associate Clinical Professor
 Randall H. Scagliotti, D.V.M., Assistant Clinical Professor
 Leigh West-Hyde, D.V.M., Assistant Clinical Professor
 Pauline L. Wong, D.V.M., Lecturer

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

230. **Principles of Anesthesia and Surgery for Investigators** (2) II. Steffey, Gourley
 Lecture—2 hours. Prerequisite: graduate or professional student or consent of instructor. Presentation and integration of principles and techniques of anesthesia and surgery for laboratory animals. Course is not restricted to student numbers.

230L. **Principles of Anesthesia and Surgery for Investigators** (2) II. Gourley, Steffey
 Discussion—1 hour. Laboratory—4 hours. Prerequisite: course 230 concurrently. Laboratory to complement course 230. Limited enrollment. (P/NP grading.)

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

411. **Small Animal Surgery** (1½ per week) I, II, III. The Staff (Vasseur in charge)
 Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for care of pet animal patients in the hospital including physical examinations, presurgical work-ups, surgery, postoperative care and follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

412. **Large Animal Surgery** (1½ per week) I, II, III. The Staff (Meagher in charge)
 Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for care of farm animal surgical patients in the hospital and outpatient clinic including physical examinations, presurgical work-up, assistance at operations, surgery, post-surgical care and follow-up under the supervision of the senior surgical staff. May be repeated for credit. (S/U grading only.)

414. **Veterinary Anesthesiology** (1½ per week) I, II, III. The Staff (Steffey in charge)
 Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for anesthetic care of patients in the operating rooms under the supervision of the senior staff. May be repeated for credit. (S/U grading only.)

420. **Veterinary Neurology** (1½ per week) I, II, III. Holliday
 Laboratory—50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for care of hospital and outpatients including history taking, neurologic examinations and special diagnostic and therapeutic procedures under the direction of the staff neurologist. (S/U grading only.)

422. **Veterinary Ophthalmology** (¾-1½ per week) I, II, III. Buyukmihci
 Laboratory—25-50 hours. Prerequisite: professional standing, House Officer in Veterinary Medical Teaching Hospital, or consent of instructor. House Officers responsible for the care of animals in the hospital and out-patient clinic including history taking, ophthalmologic examinations, special diagnostic techniques, assistance at ophthalmologic surgery and medical and post surgical care under the direction of the staff ophthalmologist. May be repeated for credit. (S/U grading only.)

492. **Large Animal Grand Rounds** (4) I, II, III. The Staff (Meagher in charge)
 Discussion—1 hour. Prerequisite: professional standing; House Officer in Veterinary Medical Teaching Hospital or consent of instructor. House Officers take an active part in the presentation and discussion of selected cases from the large animal and ambulatory clinics. (S/U grading only.)

Swedish

See Scandinavian

Textiles (A Graduate Group)

Margaret H. Rucker, Ph.D., 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)

Howard L. Needles, Ph.D., Chairperson of the Division

Division Office, 129 Everson Hall (752-6650)

Faculty

You-Lo Hsieh, Ph.D., Associate Professor
 Susan B. Kaiser, Ph.D., Associate Professor
 Mary Ann Morris, Ph.D., Professor Emeritus
 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 multidisciplinary study of textile products. Integrative product and process knowledge are stressed in relation to the production, distribution, and consumer use of textiles and apparel. Within the Textiles and Clothing major there are two options that share preparatory subject matter coursework in textiles and clothing, as well as in the social sciences-humanities and the physical sciences.

The **General Textiles and Clothing** option provides students with a broad knowledge base in both the physical and the social sciences, as relevant to the study of textiles and clothing. This base includes (a) physical and chemical properties of textiles, (b) production, end-use applications, and care of textiles, (c) apparel structures and production, and (d) social-psychological and economic aspects of textiles and clothing. Students pursuing this option are expected to have a particular area of emphasis in textiles through careful selection of restricted electives in consultation with an adviser. The option prepares students for (a) advanced studies in textiles and clothing, or related fields in the physical and social sciences, or (b) careers in textiles and clothing such as production, testing, quality control, technical service, marketing, textile journalism, and design. Those students interested in careers in extension service and teaching should consult with their adviser.

The **Textile and Apparel Marketing** option involves an emphasis in social science and business

coursework, while also providing students with an awareness of the physical nature of textile products. This option prepares students for (a) careers in marketing, management, and merchandising, as well as for (b) advanced studies in textiles and clothing with emphasis in the social-psychological or economic aspects, in marketing or administration, or in consumer behavior.

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	64-69
Textiles and Clothing 6, 8	8
Introductory psychology (Psychology 1)	4
Sociology 2	4
Economics 1A-1B	10
Written and oral expression, two courses (see College requirement)	8
History of art (Art 10H) or cultural anthropology (Anthropology 2)	4
Computer logic or programming (Computer Science Engineering 10, Agricultural Science and Management 21, or Sociology 40)	2-3
Statistics, one course (Statistics 13)	4
Physics (Physics 10 or Physics 1A, 1B)	4-6
Option—specific coursework: <i>General</i> — Chemistry 1A, 1B, 8A, 8B; or <i>Textile and Apparel Marketing</i> —Chemistry 10, Mathematics 16A-16B, Economics 11A-11B	16-18

General Textiles and Clothing

Depth Subject Matter	43
Textiles and Clothing 107, 161-161L, 162-162L, 163-163L, 164, 173, 174, 177	27
Agricultural Economics 112, 113	8
Design 143	4
Psychology 145 or 183	4

Restricted Electives	24
Courses selected from the following: Agricultural Economics 18, 141 or 141M, 142, 155, 171A, 171B, Agricultural Science and Management 150, Applied Behavioral Sciences 162, Chemistry 1C, 128A, 128B, 128C, Consumer Science 100, Design 142A, 142B, 160A, 160B, 160C, 170A, 170B, 170C, Economics 11A, 11B, 100, 101, 121A, 121B, 134, Mathematics 16A, 16B, 16C, Psychology 145, 183, Rhetoric and Communication 42, 130, 136, 140, Sociology 25, 123, 126, 140, 148, 159, 175, Statistics 106, 108; Textiles and Clothing 100, 110, 170 and the following courses with instructor's consent: Textiles and Clothing 180A- 180B, 220, 230, and a maximum of 5 units in either Textiles and Clothing 192 or 199.	

Unrestricted Electives	44-49
Recommended: two or more courses in a foreign language.	

Textile and Apparel Marketing

Depth Subject Matter	52
Social research methods (Sociology 46A or Psychology 41)	4
Psychology 145 or 183	4
Statistics 103	4
Economics 101	5
Agricultural Economics 100A-100B, 106, 136	16
Textiles and Clothing 107, 162-162L, 164, 173, 174, 177	19

Restricted Electives	15
Courses selected from the following: Agricultural Economics 18, 112, 141M, 142, 155, 171A, 171B, Anthropology 122, 126, Consumer Science 100,	

Design 143, Economics 121A, 121B,
134, 162, and other relevant
coursework, Mathematics 16C,
Psychology 145, 183, Sociology 123,
126, 140, 141, 145, Textiles and
Clothing 110, 170, and the following
courses with instructor's consent:
Textiles and Clothing 180A-180B; 220,
230; and a maximum of 5 units in either
Textiles and Clothing 192 or 199.

Unrestricted Electives	44-49
Recommended: two or more courses in a foreign language, especially for students interested in international apparel marketing.	

Total Units for the Major 180

Major Adviser. S.B. Kaiser.

Advising Center for the major is located in 129
Everson Hall (752-6650).

Textiles and Clothing Minor Program

The Textiles and Clothing minor
program is for non-majors interested in
satisfying secondary career objectives.
One course from Textiles and Clothing 6, 8 4
Courses selected from Textiles and Clothing
107, 110, 161-161L, 182-162L, 163-163L,
164, 170, 173, 174, 177 14

Minor Adviser. S.B. Kaiser

Graduate Study. A program of study is offered
leading to the M.S. degree in Textiles. Information
can be obtained from the graduate adviser, S.H.
Zeronian. Also see the Graduate Division section
in this catalog.

Related Courses. See courses in Consumer Sci-
ence 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) III. The Staff
Lecture—3 hours; laboratory—3 hours. Introduction to the
structure and properties of textiles. Consumer use and fabric
characteristics are emphasized.

8. The Textiles and Apparel Industries (4) I. Rucker
Lecture—4 hours. Study of the textile and apparel industries
including fashion theory, production, distribution, and con-
sumption of textile goods.

92. Internship in Textiles and Clothing (1-12) I, II, III. The
Staff (Needles 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.)

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

99. Special Study for Lower Division Students (1-5) I, II, III.
The Staff (Needles in charge)
(P/NP grading only.)

Upper Division Courses

100. Principles of Polymer Materials Science (3) II. 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 in-
cluding polymer structure and synthesis; polymerization
mechanisms, polymer classes, properties, and reactions;
polymer morphology, rheology, and characterization; polymer
processing. (Same course as Engineering 147.)

107. Social and Psychological Aspects of Clothing (4) III.
Kaiser
Lecture—3 hours; discussion—1 hour. Prerequisite: Sociology
2. Social and cognitive factors influencing management and
perception of personal appearance in everyday life. Concepts
and methods appropriate to the study of meaning of clothes
in social and cultural contexts. General Education credit:
Contemporary Societies/Non-Introductory. Recommended
GE prerequisite: Anthropology 2 or Sociology 2.

110. Synthetic Fibers and Plastics in Society (3) II. Needles
Lecture—3 hours. Prerequisite: Chemistry 10 or a course
in the physical sciences. Basic concepts and methodologies
in study of synthetic fibers and plastics. Fiber and plastic
formation, classification, structure, properties, processing,
formulation, and applications. Impact of fibers and plastics
on society and the environment. General Education credit:
Nature and Environment/Non-Introductory. Recommended
GE prerequisite: Chemistry 10 or introductory course in
physical sciences.

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. The Staff
Lecture—3 hours. Prerequisite: course 6. Properties of fabrics
as related to serviceability, comfort, and appearance.

162L. Textile Fabrics Laboratory (1) II. The Staff
Laboratory—3 hours. Prerequisite: course 162 (may be taken
concurrently). Laboratory methods and procedures employed
in studying properties of textile fabrics as related to ser-
viceability, comfort, and appearance.

163. Textile Coloration and Finishing (3) II. 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) II.
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: consent of instructor; 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, mecha-
nization, production engineering.

170. Advanced Clothing Structure (5) I. Hsieh
Lecture—3 hours; laboratory—6 hours. Introduction of draft-
ing, flat pattern and draping principles for deriving 2-di-
mensional patterns for 3-dimensional clothing structures.
In-depth studies of the interrelationships and the combined
applications of clothing structure principles. Analytical and
experimental approaches are emphasized for structural de-
velopment.

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 per-
sonnel.

174. Introduction to World Trade in Textiles and Clothing (2)
II. Rucker
Lecture—2 hours. Prerequisite: course 8. Structure of the
global fiber/textile/apparel complex and its distribution patterns
with an overview of political, economic, and technological
factors that are changing these industries and their markets.

177. Clothing and Social Perception (3) I. Kaiser
Lecture—3 hours. Prerequisite: course 107; Sociology 2;
Psychology 1. Social and cognitive processes related to the
meanings people assign to clothing cues when perceiving
one another. Particular 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 (Needles in charge)
Laboratory—6 hours. Prerequisite: senior standing with textile-
related major, and consent of instructor. Senior thesis on
independent problems. Research begun in course 180A will
be continued and completed in course 180B. (Deferred
grading only, pending completion of sequence.)

192. Internship in Textiles and Clothing (1-12) I, II, III. The
Staff (Needles 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 (Needles 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 (Needles in charge)
(P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Needles in charge)
(P/NP grading only.)

Graduate Courses

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) III. Kaiser Lecture—3 hours. Prerequisite: course 107, 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. Offered in odd-numbered years.

250A-250B-250C-250D-250E-250F. Special Topics in Polymer and Fiber Science (3) II. Zeronian Lecture—3 hours. Prerequisite: course 100 or consent of instructor. Selected topics of current interest in polymer and fiber science. Topics will vary each time the course is offered. (Same course as Material Science and Engineering 250A-250B-250C-250D-250E-250F.)

290. Seminar (1) I, II. Rucker 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 (Needles 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 (Needles in charge)

299. Research (1-12) I, II, III. The Staff (Needles 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 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 textile 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	63-66
Chemistry, including general and analytical (Chemistry 1A, 1B, 1C, 5)	19
Computer science (Computer Science Engineering 10)	3
Mathematics (Mathematics 16A-16B-16C or 21A-21B-21C)	9-12
Physics (Physics 6A-6B-6C)	12
Statistics (Statistics 13 or Agricultural Science and Management 150)	4
Written and oral expression (see College requirement)	8
Textiles and Clothing 6, 8	8
Depth Subject Matter	31
Textiles and Clothing 100, 161-161L, 162-162L, 163-163L, 180A, 180B	19
Organic chemistry (Chemistry 128A, 128B, 128C)	9
English 104	3
Breadth Subject Matter	20
(Courses taken in satisfaction of the General Education requirement are acceptable.)	
Social science and humanities	20
Restricted Electives	30
Select courses from the following: Agricultural Economics 18, 112, 113, 171A, 171B; Agricultural Science and Management 21; 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; Microbiology 2, 3; Statistics 32, 106, 108; Textiles and Clothing 107, 110, 164, 170, 173, 174 and 177; and 220, 230, 250A-F, 293 with consent of instructor.	
Unrestricted Electives	33-37
Total Units for the Major	180

Major Adviser. Y.L. Hsieh (*Textiles and Clothing*).
Advising Center for the major is located in 129
Everson Hall (752-6650).

Textile Science

Textiles and Clothing 6	4
Courses selected from Textiles and Clothing 100, 161-161L, 162-162L, 163-163L, 165	14

Minor Adviser. Y.L. Hsieh.

Graduate Study. A program of study is offered leading to the M.S. degree in Textiles. Information can be obtained from the graduate adviser, S.H. Zeronian. See also the Graduate Division section in this catalog.

Urology

See Medicine, School of

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., Associate Professor
Arnold J. Bloom, Ph.D., Associate Professor
Kent J. Bradford, Ph.D., Associate Professor
Marita Cantwell, Ph.D., Lecturer
James F. Harrington, Ph.D., Professor Emeritus
Frederick D. Howard, Ph.D., Senior Lecturer Emeritus
Doran L. Hughes, Ph.D., 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
Harlan K. Pratt, Ph.D., Professor Emeritus
Carlos F. Quiros, Ph.D., Associate Professor
Lawrence Rappaport, Ph.D., Professor
Charles M. Rick, Ph.D., Professor Emeritus
Vincent Rubatzky, Ph.D., Lecturer
Mikal E. Saltveit, Jr., Ph.D., Assistant Professor
Carol Shennan, Ph.D., Assistant Professor
Paul G. Smith, Ph.D., Professor Emeritus
Arthur R. Spurr, Ph.D., Professor Emeritus
Herman Timm, Ph.D., Lecturer
Ronald E. Voss, Ph.D., Lecturer
James E. Welch, Ph.D., Lecturer Emeritus
Masatoshi Yamaguchi, Ph.D., Professor Emeritus
Shang Fa Yang, Ph.D., Professor
John I. Yoder, Ph.D., Assistant 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 the Graduate Division section in this catalog.

Graduate Adviser. A.B. Bennett.

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. Vegetable Biology, Evolution and Systematics** (4) I, Yoder 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 Production, Technology and Physiology (4) III. Bradford Lecture—3 hours; laboratory—3 hours. Prerequisite: Botany 111B; Genetics 100 or Plant Science 113 recommended. Principles of crop seed production, storage and utilization. Physiological, developmental, genetic and environmental factors influencing seed quality. Biological and technological aspects of crop establishment from seeds. Laboratory sessions include field trips to seed industry facilities.

***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. Vegetables in World Food Production Systems (4) II. Lecture—3 hours; discussion—1 hour. Prerequisite: Plant Science 2 or Botany 2; course 101 recommended. World food production, evaluation of cropping systems and priorities for agricultural research. Examination of selected systems in tropical, subtropical, arid and temperate regions, emphasizing usage, cultural practices, handling, nutritional importance and current research goals for significant vegetable crops.

192. Internship in Vegetable Crops (1-12) I, II, III. The Staff (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 pre-enrollment. (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. Saltveit and Yang Lecture—2 hours; laboratory—6 hours. Prerequisite: Botany 111B or Plant Science 112. Comparative physiology of harvested vegetables; emphasis on maturation, senescence, compositional changes, physiological disorders and effects of environmental factors. Laboratories stress concepts and research procedures. Offered in even-numbered years.

220. Biotechnology and Genetics of Crop Improvement (3) I, Michelmore Lecture—3 hours. Prerequisite: Genetics 100, Plant Science 113; Genetics 102A, 102B recommended. Emphasizes the integration of modern biotechnology and classical plant breeding including: transposable elements, genetic mapping, gene identification, transformation, tissue culture, incompatibility mechanisms, male sterility, gametophyte selection, disease and stress resistance.

220L. Biotechnology and Genetics of Crop Improvement Laboratory (1) I, Michelmore Laboratory—3 hours. Prerequisite: course 220 concurrently. Several class projects in plant genetics and biotechnology: tomato genetics, isozyme segregation, *Agrobacterium* mediated plant transformation, self-incompatibility in *Brassica* species, mapping disease resistant genes.

221. Genetics and Cytogenetics of Vegetable Crops (3) III. Quiros Lecture—3 hours. Prerequisite: Plant Science 113 or the equivalent. Genetics and cytogenetics of the principal vegetables on a crop by crop basis. Current advances on the cytogenetic technology, sources of germplasm and applications to practical breeding problems.

221L. Genetics and Cytogenetics of Vegetable Crops Laboratory (2) III. Quiros Laboratory—6 hours. Prerequisite: course 221 (may be taken concurrently). Genetic and cytogenetic techniques applicable to vegetables. Includes chromosome squash preparations for pachytene analysis, segregation and linkage analysis of quantitative traits in interspecific hybrids, gene-centromere mapping, and aneuploid segregations.

225. Transposable Elements in Higher Plants (3) II. Yoder Lecture—1 1/2 hours; discussion—1 1/2 hours. Prerequisite: Biochemistry 201C or consent of instructor. Examines both the classical and molecular genetic information about plant transposable elements. Topics include the discovery, molecular structure, evolutionary significance and practical uses of these fascinating genetic entities.

***228. Plant Molecular Biology Laboratory** (4) II. Bennett, Harada (Botany)

Lecture—1 hour; laboratory—10 hours. Prerequisite: Biochemistry 101L, a course in molecular genetics, and consent of instructors; Botany 227 recommended. Research methods in plant molecular biology. Topics include analysis of gene expression, characterization of gene structure, and gene transfer technology. Emphasis will be placed on analysis of developmentally regulated gene expression.

230. Selected Methods in Vegetable Research (3) II. 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 constituents, physiological functions and cell/tissue culture. Offered in odd-numbered years.

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 standing. In-depth coverage of selected topics in vegetable crops and related disciplines. Topics and speakers determined by instructor in charge. Assignments include brief evaluation of a lecture, and pertinent narrative or grant proposal. May be repeated for credit. (S/U grading only.)

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge) Prerequisite: consent of instructor.

299. Research (1-12) I, II, III. The Staff (Chairperson in charge) (S/U grading only.)

Professional Course

300. Tutoring in Vegetable Crops (1-3) I, II, III. The Staff (Chairperson in charge) Tutoring—3-9 hours. Prerequisite: consent of instructor. Voluntary tutoring for graduate students who desire teaching experience, but who are not teaching assistants. Students under supervision may give lectures, prepare laboratory materials, experiments, and autotutorial modules, conduct discussions and demonstrations, and be involved in testing. May be repeated for a total of 6 units. (S/U grading only.)

Veterinary Medicine, School of

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
 *William J. Winchester, D.V.M., Assistant Dean
 School Office, 1018 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.)

Professional Courses

401. The Normal Animal, Examination and Topographic Anatomy (3) I, Kitchell Lecture—11 hours; discussion—10 two-hour sessions; laboratory—9 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.

402. Cell Biology (3.5) I, Tablin Lecture—22 hours; discussion—5 two-hour sessions; laboratory—8 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine, or consent of instructor.† 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 (2.9) III. Joy Lecture—26 sessions total; laboratory—3 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 (2.3) I, Giri Lecture—21 sessions total; laboratory—demonstration—2 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. Morgan 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 diagnostic radiology, radiotherapy and nuclear medicine; diagnostic applications of x-rays and basic principles of veterinary radiology.

405A. Parasitology (3.8) II. 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 antrotopods helminth and protozoan parasites of domestic animals. The relationship of these parasites to disease is briefly discussed.

405B. Clinical Parasitology (3) III. Baker Lecture—20 hours total; laboratory—10 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor.† Ecology, pathology, diagnosis, and therapeutics of the more important parasites of domestic animals.

406. Principles of Behavior (1.1) I, Hart Lecture—10 hours; 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) III. Vasseur Lecture—9 one-hour sessions total; laboratory—1 three-hour session. 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 session 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, Stover 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—1 hour; discussion—2 hours. Prerequisite: first-year standing in School of Veterinary Medicine.† Introduction to epidemiology and its applications in veterinary medicine.

410. Veterinary Toxicology (2.8) III. Mount 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, hamsters and certain related laboratory rodents will be presented to serve the needs of clinical and research veterinarians. Lecture demonstrations with subject species will be provided.

412. Laboratory Animal Medicine (2) III. Brooks
Lecture—20 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 disease needed by veterinarians in charge of research facilities.

413. Medical Primatology (2) III. Roberts
Lecture—2 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Major diseases, medical management and husbandry of captive non-human primates. (S/U grading only.)

414. Integrative Physiological Chemistry (6.6) I. Black
Lecture—47 hours total; discussion—10 hours total; laboratory—9 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. Hedrick
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.

419. Behavioral Therapy (0.8) III. Hart
Lecture—7 sessions total; laboratory—1 session. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor and course 406; open to graduate students. † Clinical application of management, conditioning procedures, castration and drug therapy to resolve common behavioral problems of dogs cats, and horses.

420A. Musculoskeletal Basis of Locomotion (5.2) I-II. Hyde
Lecture—22 hours total; laboratory—30 three-hour sessions. 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. Deferred grading only, pending completion of course.

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 (2.5) II. Bellhorn
Lecture—21 hours total; laboratory—4 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. Discussion of selected ocular diseases of various species.

423. Small Animal Ophthalmology (2) III. Buyukmichi
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—1 hour. 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. Pulmonary Medicine (2.9) I, Dungworth
Lecture—23 sessions total; laboratory—6 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Provide basic understanding of nature, causes, clinical expression, diagnosis and treatment of the important respiratory diseases of dogs, cats, horses and food animals.

425C. Cardiovascular Medicine (2.6) I, Thomas
Lecture—21 sessions total; laboratory—5 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Principles of cardiovascular medicine (pathophysiology, diagnosis, and treatment) in animals.

425D. Urinary System, Abnormal (2.5) II. Cowgill
Lecture—20 sessions total; laboratory—5 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Abnormal function of urinary system and diseases affecting this system in animals. Manifestations, pathogenesis, pathophysiology, pathology, diagnosis and medical and surgical treatment of urinary system discussed.

426. Principles of Anesthesiology (1.7) III. Steffy
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. Madigan
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) III. 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 (0.7) III. Smith
Laboratory—7 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 (4) III. Weaver
Lecture—4 hours. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. † Practical systems for delivering veterinary services to dairy farms with emphasis on disease prevention and production control. Lectures supplemented with visits to dairy farms to evaluate feeding programs and health management.

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 under-

standing 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 of Small Animals (2.5) II. Strombeck
Lecture—25 one-hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine or consent of instructor. † Abnormal function of digestive system and diseases affecting digestive system in small animals. Manifestations, pathology, pathogenesis, diagnosis including special diagnostic procedures, and medical and surgical treatments of gastrointestinal disease including diseases of the liver and pancreas.

430C. Gastrointestinal Diseases of Large Animals (2.5) III. Smith
Lecture—25 one-hour sessions total. Prerequisite: second-year standing in School of Veterinary Medicine or consent of instructor. † Abnormal function of digestive system and diseases affecting digestive system in large animals. Manifestations, pathology, pathogenesis, diagnosis including special diagnostic procedures, and medical and surgical treatment of gastrointestinal disease including diseases of the liver and pancreas.

431. Metabolism (1.5) II. Black
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. West
Lecture—15 sessions total. Prerequisite: 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 (4.5) I, Pedersen
Lecture—45 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine. Overview of select infectious diseases of companion and food animals.

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 system 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.

437. Ethical Issues and Perspective in Veterinary Medicine (2) I, Brooks
Discussion—3 hours. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. † Introduction to less known opportunities for a veterinary career and to ethical issues pertaining to the use and care of animals. (S/U grading only.)

438. Introduction to Methods of Animal Handling, Restraint, Examination and Therapy (1) III. East
Laboratory—8 three-hour sessions. Prerequisite: first-year standing in School of Veterinary Medicine or consent of instructor. Introduction and practice of methods of animal handling and restraint and selected techniques of diagnostic examination and therapy, as well as recognition of animal breeds, breed characteristics and purpose in animal species of veterinary importance. (S/U grading only.)

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 (6.2) II-III. Stabenfeldt
Lecture—42 one-hour sessions; laboratory—20 three-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine. † Structure, function, pathologic and clinical aspects of reproduction (normal and abnormal). (Deferred grading only, pending completion of course.)

445B. Small Animal Theriogenology (1.2) III. Feldman
Lecture—12 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor. Conditions affecting the reproductive system in the dog and cat, with emphasis on symptomatology, pathophysiology and treatment. Stressing the development of diagnostic and therapeutic approaches to the clinical patient.

445C. Food Animal Theriogenology (3) II. BonDurant
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) I, Gershwin
Lecture—19 hours total; laboratory—11 two-hour sessions total. 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
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
Lecture—24 sessions total; laboratory—18 two-hour sessions. Prerequisite: second-year standing in School of Veterinary Medicine.† Basic pathologic processes, especially their nature and pathogenesis. Includes degenerative changes, circulatory disturbances, inflammation and repair, abnormalities of cell growth and differentiation, and basic immunopathology.

453. Viral Pathogens of Animals (2.6) II. Zee
Lecture—16 hours total; laboratory—10 sessions 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.

454. Clinical Immunology (2) II. Pedersen
Lecture—14 one-hour sessions; laboratory—6 three-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor.† Immune mediated diseases of domestic animals with emphasis on mechanism of disease production, diagnosis, and therapy. Relevant diagnostic tests, their interpretations, and sampling techniques.

455. Integumentary System (4.9) I-II. Stannard
Lecture—49 hours total. Prerequisite: third-year standing in School of Veterinary Medicine or consent of instructor.† 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 two-quarter course.)

456. Jurisprudence and Law for the Veterinarian (2) II. Wilson
Lecture—10 two-hour sessions. Prerequisite: third-year standing in School of Veterinary Medicine. Introduction to principles of veterinary medical jurisprudence and legal concepts pertinent to professional activities. (S/U grading only.)

457. Veterinary Business Management (2) II. Wilson
Lecture—10 two-hour sessions. Prerequisite: third- or fourth-year standing in School of Veterinary Medicine or consent of instructor. Course presents a groundwork of information which is essential to the successful management of a veterinary practice. Topics to be covered include basic accounting, medical recordkeeping, money management, business and personal insurance, client relations and tax law. (S/U grading only.)

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) III. Haskins
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 (1.7) II. Wind
Lecture—14 sessions total; laboratory—3 sessions total. Prerequisite: third-year standing in School of Veterinary Medicine.† Surgical approaches to joints of the shoulder,

hip and stifle, and fractures of the humerus, scapula, radius, ulna, pelvis, femur, and tibia, and meta carpals/tarsals.

462. Radiographic Diagnosis: Small Animal (2.5) III. Nyland
Lecture—16 one-hour sessions; discussion—8 two-hour and 1 one-hour sessions. 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.

463. Soft Tissue Surgical Diseases of Small Animals (1.0) III. Gregory
Lecture—10 sessions total. Prerequisite: junior standing in School of Veterinary Medicine.† Pathophysiology and surgical treatment of selected soft tissue disease processes in small animals

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. Ilikiw
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
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
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 VM Teaching Hospital. (S/U grading only, pending completion of three-quarter sequence.)

471. General Practice Clinics (2.5-15) 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 VM Teaching Hospital with equivalent emphasis on small and large animal species. May be repeated for credit. Students in combined DVM/MPVM program enroll for the summer-fall sequence. (S/U grading only, pending completion of three-term sequence.)

472. Urban Practice Clinics (2.5-15) I-II-III. Hjerpe
Veterinary clinical practices—40 hours, plus animal-patient care and emergency/night coverage (by rotation). Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor.† Clinical training in veterinary medicine. Student assignments in medical and surgical services and clinical diagnostic laboratories of VM Teaching Hospital with emphasis on those services relating to urban veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Session I-II 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 VM Teaching Hospital with emphasis on those services relating to large animal veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II 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 VM Teaching Hospital with emphasis on those services relating to equine veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Session I-II 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 VM Teaching Hospital with emphasis on those services relating to food animal veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II 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 VM Teaching Hospital with emphasis on those services relating to zoological veterinary practice. May be repeated for credit. Students in combined DVM/MPVM program enroll for the Summer Sessions I-II and I sequence. (S/U grading only, pending completion of three-term sequence.)

477. Companion Animal Practice Clinics (2.5-15) I, II, III, summer. Hjerpe
Clinic—40 hours. Prerequisite: fourth-year standing in School of Veterinary Medicine or consent of instructor (Summer Session students must be enrolled in DVM/MPVM degree program). Clinical training in veterinary medicine. Assignments in the medical and surgical services and clinical diagnostic laboratories of the VM Teaching Hospital with emphasis on small and equine species. May be repeated for credit. (S/U grading only, pending completion of course.)

480A-480B. Clinic Rounds for Freshmen (0.4-0.4) II-III. The Staff (Director VMTH in charge)
Discussion—eight 1½ hour sessions per year. Prerequisite: first-year standing in School of Veterinary Medicine.† Discussion of selected cases from VM Teaching Hospital. (S/U grading only, pending completion of course 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)

, Chairperson of the Department

Department Office, 2075 Haring Hall (752-1400)

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
Anthony E. Castro, D.V.M., Ph.D., Associate Adjunct Professor (California Veterinary Diagnostic Laboratory)

Patricia A. Conrad, D.V.M., Ph.D., Assistant Professor

Laurel J. Gershwin, D.V.M., Ph.D., Associate Professor

Dwight C. Hirsh, D.V.M., Ph.D., Professor
 Rance B. LeFebvre, Ph.D., Assistant Professor
 Preston A. Marx, Ph.D., Assistant Adjunct Professor
 Delbert G. McKercher, D.V.M., Ph.D., Professor Emeritus
 John W. Osebold, D.V.M., Ph.D., Professor Emeritus
 Jeffrey L. Stott, Ph.D., Assistant Professor
 Ming Ming Wong, Ph.D., Professor Emeritus
 Tilahun Yilma, D.V.M., 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, Hirsh, Stott
 Lecture—3 hours alternate weeks with lecture—2 hours and discussion—1 hour. Prerequisite: Biochemistry 101A or the equivalent. Immune response and defenses of host against infection: antibodies, antigens, antibody-antigen interactions, regulation and manipulation of the immune response, hypersensitivity mechanisms and their relationships to disease processes. Clinical applications of immune phenomena emphasized.

126L. Immunology Laboratory (2) II, Stott
 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, Hirsh, LeFebvre
 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
 Lecture—3 hours. Prerequisite: Biochemistry 101A or the equivalent. Fundamental physical and chemical properties of animal viruses; methods of propagation, purification and assay. Mechanisms of viral replication and pathogenesis of viral infections in man and animals. Immunity to virus diseases and oncogenic properties of animal viruses.

132. Introduction to Parasitology (5) III, Conrad
 Lecture—3 hours; laboratory—6 hours. Prerequisite: 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.)

Graduate Courses

228. Molecular Biology of Animal Virus (3) II, The Staff
 Lecture—3 hours. Prerequisite: course 128 or Microbiology 162 or the equivalent. Current status of molecular biology of the major groups of animal viruses. Topics of major emphasis include: virus genome structure, strategy of genome replication and transcription, and regulation of genome expression.

270. Advanced Immunology (3) III, Stott
 Lecture—3 hours. Prerequisite: course 126 or Veterinary Medicine 450 or consent of instructor. Immunoglobulin structure and function, antigenic determinants, complement. Biology of lymphocytes; cell-mediated immune reactions, immunogenetics, hypersensitivity. Pathogenetic mechanisms in immunological diseases, immunological unresponsiveness, cancer immunology. Dynamics of infection and resistance. Methods in immunochemistry and immunobiology. Offered in odd-numbered years.

291. Seminar in Immunology (1) I, II, III, Gershwin
 Seminar—1 hour. A discussion of the current topics in immunology. (S/U grading only.)

292. Seminar in Animal Virology (1) I, II, III, The Staff
 Seminar—1 hour. A discussion of the current topics in animal virology. (Same course as Microbiology 296.)

293. Seminar in Infectious Diseases (1) I, II, III, The Staff
 Seminar—1 hour. Discussion of current topics and cases of infectious diseases. (S/U grading only.)

294. Seminar in Parasitology (1) III, Baker, Conrad
 Seminar—1 hour. Discussion of current topics in veterinary parasitology and entomology.

296. Microbiological Diagnosis (2-5) I, II, III, Biberstein, 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)

Shri N. Giri, B.V.Sc., Ph.D., Chairperson of the Department

Department Office, 2165 Haring Hall (752-1059)

Faculty

Alan R. Buckpitt, Ph.D, Associate Professor
 Gaylord M. Conzelman, Jr., Ph.D., Professor Emeritus

Shri N. Giri, B.V.Sc., Ph.D., Professor
 Robert M. Joy, Ph.D., Professor
 Michael E. Mount, D.V.M., Ph.D., Associate Professor

Isaac N. Pessah, Ph.D., Assistant Professor
 Otto G. Raabe, Ph.D., Professor in Residence
(Veterinary Pharmacology and Toxicology, Civil Engineering)

Henry J. Segall, Ph.D., Associate Professor
 Philip R. Vulliet, D.V.M., Ph.D., Assistant Professor
 Hanspeter Witschi, M.D., Professor *(Medicine, Internal Medicine)*

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, Vulliet
 Lecture—1 hour; discussion—1 hour. Prerequisite: comparative or veterinary physiology and general pharmacology. Concepts of pharmacokinetics. Absorption and disposition of various drugs, which are used as therapeutic agents, will be compared in different species (man and domestic animals). Course will provide background for research in clinical pharmacology.

243. Heavy Metal Toxicity and Metabolism (2) II, Raabe
 Lecture—2 hours. Prerequisite: Biochemistry 101A-101B and Physiology 100A-100B. Toxicity and metabolism of inorganic compounds with emphasis on heavy metals. Examines the relationship between chemical properties and biologic activity of various metals. Includes discussions on metal-protein interactions, genetic disorders in metabolism, chelation therapy, and inorganic carcinogenesis.

***253. Drug Metabolism** (2) III, Giri, Buckpitt
 Lecture—2 hours. Prerequisite: Biochemistry 101A-101B or Physiological Sciences 101A-101B; consent of instructor. General pathways of drug metabolism and factors influencing the drug metabolism. Emphasis laid upon the species, age, and genetic differences affecting the biological disposition of the drugs. Offered in even-numbered years.

258. Drug Receptors (2) III, Joy, Pessah
 Lecture—2 hours. Prerequisite: Pharmacology and Toxicology 201, 202, 203 or the equivalent. Theories of drug-receptor interactions and their application to known receptor systems stressed. Present concepts of adrenergic, cholinergic, opiate, and other receptor mechanisms considered in conjunction with their physiological importance. Offered in odd-numbered years.

290. Seminar (1) I, II, III, The Staff (Chairperson in charge)
 Seminar—1 hour. (S/U grading only.)

297T. Tutoring in Pharmacology (1-5) I, II, III, The Staff (Chairperson in Charge)

Students assist in preparation and teaching of courses in Veterinary Pharmacology/Toxicology or other courses offered by the department under direct supervision of the instructor. Designed for graduate or professional students who desire teaching experience. May be repeated for credit up to 5 units. (S/U grading only.)

298. Group Study (1-5) I, II, III, The Staff (Chairperson in Charge)

Prerequisite: consent of instructor. Group study in selected areas of Pharmacology and Toxicology. (S/U grading only.)

299. Research (1-12) I, II, III, The Staff (Chairperson in charge)
 (S/U grading only.)

Professional Course

405. Veterinary Clinical Pharmacology (2) II, Vulliet
 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)

Michael G. Mullins, Ph.D., Chairperson of the Department

Department Office, 1023 Wickson Hall (752-0380)

Faculty

Douglas O. Adams, Ph.D., Assistant Professor
 Maynard A. Amerine, Ph.D., Professor Emeritus
 Linda F. Bissot, Ph.D., Assistant Professor
 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 Emeritus
(Viticulture and Enology, Chemistry)

W. Mark Kliever, 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., Associate Professor
 Janice C. Morrison, Ph.D., Assistant Professor
 Michael G. Mullins, Ph.D., Professor
 Clayton E. Nelson, Ph.D., Professor Emeritus
 Ann C. Noble, Ph.D., Professor
 Harold P. Olmo, Ph.D., Professor Emeritus
 Cornelius S. Ough, D.Sc., Professor
 Dewey D. Y. Ryu, Ph.D., Professor *(Chemical Engineering)*

Vernon L. Singleton, Ph.D., Professor
 Robert J. Weaver, Ph.D., Professor Emeritus
 A. Dinsmoor Webb, Ph.D., Professor Emeritus
 Larry E. Williams, Ph.D., Associate Professor
 Albert J. Winkler, Ph.D., L.L.D., Professor Emeritus

The Program of Study. Enology is a specialization under the Fermentation Science major; and viticulture is a specialization under the Plant Science and the Agricultural Science and Management (Plant Science option) majors.

Graduate Study. Various graduate groups offer programs of study leading to advanced degrees in the fields of viticulture and enology. For the M.S. 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. Kunkee; II. Singleton; III. Noble

Lecture—2 hours; discussion—1 hour. An introduction to wine technology, including effects of alcohol, history of wine, fermentation, production practices, wine types, and the wine industry of California and other wine producing areas.

99. Special Study for Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)
(P/NP grading only.)

Upper Division Courses

100. Grape Growing (3) I, Williams

Lecture—2 hours; laboratory—3 hours. Prerequisite: Plant Science 2 or Botany 2, or consent of instructor. Grape growing including botany (morphology); distribution, domestication, propagation, varieties (uses), climatic requirements, crop utilization, grape regions, production practices, common diseases, insect pests, vineyard grape sampling. Not open to students having received credit for course 116A or 116B.

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, Matthews

Lecture—2 hours; laboratory—3 hours; one Saturday field trip. Prerequisite: Plant Science 2 or consent of instructor; Soil Science 100 and Botany 111A recommended. Principles and practices of pruning, irrigation, frost protection, mineral nutrition, and propagation of vines, plant-environment factors determining fruit growth and composition.

116B. General Viticulture (3) III, Kiewer

Lecture—2 hours; laboratory—3 hours; one Saturday field trip. Prerequisite: Botany 2 or the equivalent; course 116A. Economic and scientific principles of vine training and development. Summer pruning. Canopy management practices including trellising, shoot positioning, hedging, leaf removal. Carbohydrate nutrition, flower development, fruit set, thinning, girdling, and use of growth regulators. Virus and fungal diseases 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 grape-juice and wine analysis, and the reasons for use of each analysis. Analyses of a practical and useful nature are chosen for the laboratory exercises demonstrating various chemical, physical and biochemical methods.

124. Wine Production (3) I, Bisson

Lecture—2 hours; laboratory—3 hours. Prerequisite: course 3, Microbiology 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 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.

127. Wine Aging: Effects and Reactions (1) III, Singleton

Lecture—seven 1½-hour evening sessions. Prerequisite: course 124. Survey of the methods, chemistry, sensory effects, and management of storage and aging of the major classes of wine.

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. Offered in even-numbered years.

***186. Fermentation Science** (3) III, Kunkee, Ogrzydziak (Food Science and Technology)

Lecture—3 hours. Prerequisite: Microbiology 2, 3; Biochemistry 101B. Basic principles of fermentation science and biotechnology with emphasis on industrial fermentation processes that generate useful products including fermented food and beverages, pharmaceuticals, fine chemicals, and other gene products. Offered in odd-numbered years.

192. Internship (1-12) I, II, III, summer. The Staff (Chairperson 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 (Chairperson in charge)

Prerequisite: consent of instructor. (P/NP grading only.)

199. Special Study for Advanced Undergraduates (1-5) I, II, III. The Staff (Chairperson in charge)

(P/NP grading only.)

Graduate Courses

210. Grape Development and Composition (4) III, Morrison

Lecture—3 hours; discussion—1 hour. Prerequisite: Botany 105, 111A, 111B; Biochemistry 101A, and 101B recommended. Anatomy, physiology and biochemistry of grape berry development, with emphasis on the development of grape composition relevant to winemaking.

216. Vineyard Establishment and Development (3) I, Kiewer

Lecture—1 hour; discussion—1 hour; laboratory—five 6-hour sessions. Prerequisite: course 116A, 116B, 105, Soil Science 100. Application of basic knowledge in viticulture, meteorology, soil, water, plant, and biological sciences to establish and develop vineyards. Preparation of a comprehensive feasibility study of the suitability of a given piece of property for growing wine, raisin or table grapes.

217. Microbiology of Wine Production (3) III, Kunkee

Lecture—1 hour; laboratory—6 hours. Prerequisite: courses 123, 124, Microbiology 3, Biochemistry 101A, and Chemistry 8B; courses 125, 128 recommended. 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 10 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, Adams

Seminar—1 hour. Prerequisite: consent of instructor. (S/U grading only.)

290C. Advanced Research Conference (1) I, II, III. Research Faculty

Discussion—1 hour. Prerequisite: graduate standing and consent of instructor. Planning and results of research programs, proposals, and experiments. Discussion and critical evaluation of original research being conducted by the group. Discussion led by individual research instructors for research group. May be repeated for credit. (S/U grading only.)

291. Advances in Viticulture (1) II, Matthews

Seminar—1 hour. Prerequisite: consent of instructor. Experts in various fields of Viticulture will lead discussions on recent advances in their fields of expertise. Emphasis and topics will vary from year to year and course may be repeated for credit. (S/U grading only.)

292. Advances in Enology (1) III, 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 faculty to acquaint students with their current research interests. May be repeated for credit. (S/U grading only.)

297T. Tutoring in Viticulture and Enology (1-5) I, II, III. The Staff (Chairperson in charge)

Prerequisite: graduate standing and consent of instructor. Designed for graduate students who desire teaching experience, but are not teaching assistants. Student contact primarily in laboratory or discussion sections, and under direction of a faculty member.

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.)

Water Science

(College of Agricultural and Environmental Sciences)

Faculty. See under the Departments of Land, Air and Water Resources; Agricultural Engineering; Civil Engineering; Geology; and Geography.

Related Major Program. See the major in Soil and Water Science.

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 the Graduate Division section in this catalog.

Graduate Adviser. D.E. Rolston (*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, Silk

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. General Education credit: Nature and Environment/Introductory.

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, Puento

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. The Staff

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. Hopmans
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. The Staff
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—3 hours. 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. Grismer
Lecture—3 hours. Prerequisite: Engineering 103A or course 142. Flow through porous media; measurement of hydraulic conductivity; seepage under hydraulic structures; anisotropy flow nets, drainage design for water table and salt control. (Same course as Engineering: Agricultural 140.)

141. Hydrology (3) II. Puento
Lecture—3 hours. Prerequisite: consent of instructor. Principles of hydrologic analysis including consideration of precipitation, stream flow and ground water phenomena.

142. Hydraulics (3) I, Scott, Burgy
Lecture—2 hours; laboratory-discussion—3 hours. Prerequisite: Physics 1A; 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.

150. Water Law and Water Institutions (3) II. The Staff
Lecture—3 hours. Introductory course in water law and institutions. Current problems. Basic principles, with utilization of case-study method. Water rights: kind, acquisition, adjudication, administration and loss. Water organizations and enterprises; kinds, organization, financing, public regulation. Acreage limitation. Water pollution.

***154. Water and Related Resource Allocation from Economic Principles** (2) I, Grimes
Lecture—2 hours. Prerequisite: Mathematics 16A or consent of instructor. An examination of information needed for analysis and basic procedures of production economics used for an appropriate allocation of water and related resources in agriculture. Cost minimization in production and alternative goals are considered. Offered in even-numbered years.

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. Hopmans
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 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. Hopmans
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) III. The Staff
Lecture—2 hours. Prerequisite: Atmospheric Science 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.

206. Water Resource Systems Analysis (3) I, Mariño
Lecture—3 hours. Prerequisite: course 141 and Statistics 131A, or consent of instructor. Applications of deterministic and stochastic mathematical programming techniques to water resource planning, analysis, and design. Water allocation, capacity expansion, and reservoir operation. Conjunctive use of surface water and groundwater. Water quality management. Irrigation planning and operation models.

***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, phycology, and fish biology. 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.

240. Infiltration and Drainage (3) II. Grismer
Lecture—3 hours. Prerequisite: Soil Science 107; course

140/Agricultural Engineering 140. Aspects of multi-phase flow in soils and their application to infiltration and drainage. Gas phase transport and entrapment during infiltration, and transient drainage with nonlinearity, capillarity, and evapotranspiration. Offered in odd-numbered years. (Same course as Agricultural Engineering 240.)

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. The Staff
Seminar—1 hour. Prerequisite: graduate standing and background in water-soil-plant relations. Informal presentation on current developments in water-soil-plant relations, plant water use, and irrigation management. Associated discussion analyzes research approaches and techniques and data interpretations. (S/U grading only.)

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)

Wesley W Wallender, Ph.D., Chairperson of the Group (752-0688)

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. D. E. Ralston (Land, Air and Water Resources), 251 Hoagland Hall (752-2113).

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)

Daniel W. Anderson, Ph.D., Chairperson of the Department

Department Office, 66 Briggs Hall (752-6586)

Faculty

Daniel W. Anderson, Ph.D., Professor
 Louis W. Botsford, Ph.D., Associate Professor
 Joseph J. Cech, Jr., Ph.D., Professor
 Ronald E. Cole, B.S., Lecturer
^{3,4}Christopher Dewees, Ph.D., Lecturer
 Walter E. Howard, Ph.D., Professor Emeritus
 Nadine K. Jacobsen, Ph.D., Associate Professor
 Dale F. Lott, Ph.D., Professor
 Rex E. Marsh, A.B., Lecturer
 Peter B. Moyle, Ph.D., Professor
 Dennis G. Raveling, Ph.D., Professor
 Terrell P. Salmon, Ph.D., Lecturer
 Robert G. Schwab, Ph.D., Associate Professor
 Charles van Riper, Ph.D., Associate Adjunct 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 with approval. (Courses shown without parentheses are required.)

	UNITS
Preparatory Subject Matter	53-60
Biology (Biological Sciences 1)	5
Botany (Botany 2)	5
Chemistry (Chemistry 1A, 1B, 8A, 8B)	16
Computer science (Computer Science Engineering 10 or Engineering 5)	3
Mathematics (Mathematics 16A, 16B; 16C recommended)	6-9
Physics (Physics 6A, 6B; 6C recommended)	8-12
Statistics (Statistics 13, or Agricultural Science and Management 150)	4
Zoology (Zoology 2-2L)	6
Depth Subject Matter	38-41
Chemistry (Biochemistry 101A-101B or Physiological Sciences 101A-101B)	6-7
Ecology (Environmental Studies 100 or Zoology 125)	3-4
Genetics (Genetics 100)	4
Physiology (Physiology 110)	5
Vertebrate anatomy (Zoology 105)	5
Evolution (Zoology 148, or Genetics 103)	3-4
Wildlife and fisheries biology (Wildlife and Fisheries Biology 122, 130, 140)	12
Breadth Subject Matter	20
English 1 and Rhetoric and Communication 1	8
Social sciences and humanities†	12
Restricted Electives (Select Plan I or Plan II)	
Plan I: Wildlife Biology specialization	24-26
Botany (Botany 102 or 108, 117)	9
Wildlife biology (Wildlife and Fisheries Biology 100, 110, 111, 111L)	13
Statistics (Statistics 104, 106, 108, or 110)	3-4
Plan II: Fisheries Biology specialization	26-32
Aquatic entomology/invertebrate zoology (Entomology 116 or Zoology 112 with adviser's approval)	3-5
Fisheries biology (Wildlife and Fisheries Biology 102, 120, 120L, 121)	14
Limnology/oceanography/stream biology (Environmental Studies 116 or 150C or 151 or Water Science 122)	3-4
Statistics (Statistics 104, 106, 108 or 110)	6-9
Unrestricted Electives	27-45
Plan I	33-45
Plan II	27-43
(For requirements of profession certification programs, see adviser.)	
Unrestricted Electives	(variable)
Total Units for the Major (minimum)	180

Major Adviser. L. W. Botsford.

Graduate Study. See the Graduate Division section in this catalog.

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. Concepts of Wildlife Ecology (4) I. The Staff
 Lecture—3 hours; discussion—1 hour. Prerequisite: Biological Sciences 1 recommended. Concepts of ecology needed to understand wildlife issues such as endangered species, fisheries management, hunting and pest management. Includes political, economic, social and legal aspects. General Education credit: Nature and Environment/Introductory.

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.)

†Units earned in satisfaction of the American History and Institutions requirement may be used in partial satisfaction of the Social Sciences and Humanities requirements.

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 pre-enrollment. 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 non-domestic 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; laboratory—3 hours. Prerequisite: Mathematics 16A-16B; Statistics 13 or the equivalent; an upper division course in ecology. Description of bird, mammal and fish population dynamics, modeling philosophy, techniques for estimation of animal abundance (e.g., mark-recapture, change-in-ratio, etc.), mathematical models of populations (e.g., Leslie matrix, logistic, dynamic pool, stock-recruitment); case histories.

130. Physiological Ecology of Wildlife (4) II. Jacobsen
 Lecture—3 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.

131. Biology and Management of Cervidae (3) II. Jacobsen
 Lecture—2 hours; laboratory—3 hours. Prerequisite: Physiology 110 and Zoology 125, or the equivalent; course 110 recommended. Evolution, biology, and management of cervids. Topics include differences in nutritive ecology, bioenergetics, reproduction and growth, use of habitats, and research methodologies. Emphasis on North American species of caribou, elk, moose and deer. Offered in odd-numbered years.

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—3 hours; discussion—1 hour. 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.

153. Wildlife Ecotoxicology (4) II, Anderson

Lecture—3 hours; discussion—1 hour. Prerequisite: introductory courses in organic chemistry, ecology, and physiology, or consent of instructor; Environmental Toxicology 101 recommended. Various forms of environmental pollution in relation to fish and wildlife, the effects and mechanisms of pollutants, effects on individuals and systems, laboratory and field ecotoxicology, examples/case histories, philosophical/management considerations. Offered in 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.

252. Principles of Vertebrate Control (3) I, Howard

Lecture—3 hours. Prerequisite: graduate standing or consent of instructor. Principles and concepts concerning the ecological, behavioral, economic, philosophical, and historical basis of managing wild vertebrates that have become pests.

290. Seminar (1-3) I, II, III, The Staff (Chairperson in charge)

Seminar—1-3 hours. Prerequisite: consent of instructor.

Seminar devoted to a highly specific research topic in any area of wildlife or fisheries biology. Special topic selected for a quarter will vary depending on interests of instructor and students. (S/U grading only)

290C. Research Group Conference (1) I, II, III, The Staff (Chairperson in charge)

Discussion—1 hour. Prerequisite: consent of instructor. Weekly conference on research problems, progress and techniques in wildlife and fisheries 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)

Lynn E. Roller, Ph.D. Program Director

Program Office, Women's Resources and Research Center, 10 Lower Freeborn Hall (752-3307/3372)

Committee in Charge

Norman Jean Cooper (*DSAC Representative*)

²Caroline Henton, D.Phil. (*Linguistics*)

Suad Joseph, Ph.D. (*Anthropology*)

Anna K. Kuhn, Ph.D. (*German*)

⁴Barbara J. Merino, Ph.D. (*Education*)

Linda A. Morris, Ph.D. (*English*)

³Michèle Praeger, Ph.D. (*French*)

Donna K. Reed, Ph.D. (*Comparative Literature*)

Lynn E. Roller, Ph.D. (*Classics*)

Dee Smith (*Academic Peer Adviser*)

Lenora A. Timm, Ph.D., ex officio (*Linguistics*)

Wendy Virga (*Staff Assistant*)

Faculty

William M. Bowsky, Ph.D., Professor (*History*)

Cynthia L. Brantley, Ph.D., Associate Professor (*History*)

Susan Crockenberg, Ph.D., Professor (*Applied Behavioral Sciences*)

Karen P. Ericksen, Ph.D., Professor (*Psychology*)

Jack D. Forbes, Ph.D., Professor (*Anthropology, Applied Behavioral Sciences*)

¹Sarah B. Hrdy, Ph.D., Professor (*Anthropology*)

Sarah V. Hutchison, M.Ed., Lecturer Emeritus (*Applied Behavioral Sciences*)

Suad Joseph, Ph.D., Associate Professor (*Anthropology*)

Anna K. Kuhn, Ph.D., Associate Professor (*German*)

Dianne Sachko Macleod, Ph.D., Assistant Professor (*Art History*)

Sandra J. McPherson, B.A., Associate Professor (*English*)

Jacquelyn Mitchell, Ed.D., Assistant Professor (*Afro-American Studies*)

Linda A. Morris, Ph.D., Lecturer (*English*)

Beatriz M. Pesquera, Ph.D., Assistant Professor (*Sociology*)

²Ruth E. Rosen, Ph.D., Associate Professor (*History*)

⁴Vicki L. Ruiz, Ph.D., Associate Professor (*History*)

Stephanie A. Shields, Ph.D., Associate Professor (*Psychology*)

Barbara Sommer, Ph.D., Visiting Lecturer

⁴Adaljiza Sosa-Riddell, Ph.D., Lecturer S.O.E. (*Chicano Studies*)

Judith Stacey, Ph.D., Associate Professor (*Sociology*)

Lenora A. Timm, Ph.D., Associate Professor (*Linguistics*)

Marian B. Ury, Ph.D., Associate Professor (*Comparative Literature*)

Merline A. Williams, M.A., Lecturer

The Major Program

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 socio-economic structures. 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.

Students majoring in this field may take courses in Afro-American studies, American studies, anthropology, comparative literature, English, history, linguistics, 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 Preparatory Subject Matter listed for a single discipline in an area of student's interest, chosen in consultation with adviser	12-25

Depth Subject Matter	44
Women's Studies 190A-190B	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	
Area A: Women and the Humanities	(minimum) 8
Comparative Literature 135, 159C, English 155B, 185, Linguistics 113.	
Area B: Gender and Society	(minimum) 12
Afro-American Studies 123, 133, American Studies 101B, Anthropology 130, 131, 134, Asian American Studies 112, Chicano Studies 102, Human Development 110, Native American Studies 180, Political Science 166, Psychology 114, 149, Sociology 131, 132, 133.	
Special topic courses	(maximum) 16
(List of acceptable courses offered throughout the University, will be available from major advisers.)	

Total Units for the Major 64-77

Recommended

The following courses are recommended: American Studies 1F, 30, Biological Sciences 10, Economics 151B, Genetics 10, History 72B, Physiology 10, Statistics 13.

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	
	20
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).	

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. General Education credit: Contemporary Societies/Non-Introductory. Recommended GE prerequisite: any introductory GE course in the areas of Civilization and Culture or Contemporary Societies.

Upper Division Courses

190A. Senior Research Seminar I (4) I. 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) II. 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

Work-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

Orville E. Thompson, Ph.D., Program Manager

Engineering and Physical Sciences

Kevin T. Bennett, Program Manager

Health and Biological Sciences

Linda R. Hughes, Program Manager

Liberal Arts

Donald J. Hagerty, Program Manager

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 required evaluation reports. The notation briefly describes the nature and location of the internship experience. Questions pertaining to academic credit and Transcript Notation may be directed to the 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)

John H. Crowe, Ph.D., Chairperson of the Department

Arthur M. Shapiro, Ph.D., Vice-Chairperson of the Department

Department Office, 2320 Storer Hall (752-1272)

Faculty

Hilary J. Anderson, Ph.D., Assistant Adjunct Professor

Peter B. Armstrong, Ph.D., Professor

Ronald J. Baskin, Ph.D., Professor (*Zoology, Physiology*)

James S. Clegg, Ph.D., Professor

John H. Crowe, Ph.D., Professor

David W. Deamer, Ph.D., Professor

^{3,4}Carol A. Erickson, Ph.D., Associate Professor

Robert D. Grey, Ph.D., Professor

Richard K. Grosberg, Ph.D., Assistant Professor

Milton Hildebrand, Ph.D., Professor Emeritus

Everett W. Jameson, Jr., Ph.D., Professor Emeritus

Roger J. Leslie, Ph.D., Assistant Professor

Milton A. Miller, Ph.D., Professor Emeritus

Brian Mulloney, Ph.D., Professor

Jeanette E. Natzle, Ph.D., Assistant Professor

Richard L. Nuccitelli, Ph.D., Associate Professor

James F. Quinn, Ph.D., Assistant Professor

(*Zoology, Environmental Studies*)

Lauren E. Rosenberg, Ph.D., Professor Emeritus
Robert L. Rudd, Ph.D., Professor Emeritus
George W. Salt, Ph.D., Professor
Thomas W. Schoener, Ph.D., Professor
H. Bradley Shaffer, Ph.D., Assistant Professor
Arthur M. Shapiro, Ph.D., Professor
Herman T. Spieth, Ph.D., Professor Emeritus
Judy Stamps, Ph.D., Professor
Catherine A. Toft, Ph.D., Associate Professor
Kenneth E. F. Watt, Ph.D., LL.D., Professor
Martin Wilson, Ph.D., Associate Professor
Stephen L. Wolfe, Ph.D., Professor Emeritus

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	40-46
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 6A-6B	6-8
One course from Microbiology 2, 102, Botany 2, Physics 6C	
	3-5
Depth Subject Matter	36-41
Genetics 100	4
Zoology 130 or 121A-121B	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 36 units or more	
	20-25
Include at least (a) 15 units in zoology, and (b) one course from two of the four Areas of Study shown below.	

Total Units for the Major 76-87

Recommended

Geology 3; Biochemistry 101A-101B or Physiological Sciences 101A-101B.

Zoology

B.S. Major Requirements:

	UNITS
Preparatory Subject Matter	53-60
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 6A, 6B, 6C	12
One course from Microbiology 2, 102, or Botany 2	
	3-5
Depth Subject Matter	49-55
Biochemistry 101A-101B or Physiological Sciences 101A-101B	
	6-7

Genetics 100	4
Statistics 102	4
Zoology 130 or 121A-121B	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	22-28
Include at least (a) 15 units in zoology, (b) 6 units (or 18 hours) of laboratory, and (c) one course from three of the four Areas of Study shown below.	

Breadth Subject Matter

<i>College of Agricultural and Environmental Sciences students</i>	23
English and/or rhetoric	7
Social sciences and/or humanities	16

See also the College section for additional requirements.

College of Letters and Science students:

Refer to the College section for a description of requirements to be completed in addition to the major.

Total Units for the Major 102-115

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, Entomology 100.
3. Developmental biology: Zoology 100, 100L, 101.
4. 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 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, 100L
 Anthropology 151, 152, 153, 154A, 154B, 155, 156
 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, 115A, 115B
 Environmental Studies 110, 116, 121, 123, 150C, 151, 151L
 Genetics, all upper division courses
 Geology 106, 107, 107L, 111A, 111B, 145, 146, 150C
 Microbiology, all upper division courses
 Nematology 110
 Nutrition 110, 111, 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, 120L, 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. Substitutions of courses not on the above list 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 also the section on 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 re-

garding graduate study write to the Graduate Adviser, Department of Zoology. See also the Graduate Division section in this catalog.

Graduate Advisers. P.B. Armstrong, R.K. Grosberg, B. Mulloney, J.E. Natzie, H.B. Shaffer, J. Stamps (in charge), C.A. Toft.

Courses in Zoology**Lower Division Courses**

2. General Zoology (4) I, Toft; II, Stamps; 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, Stamps; 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)
 (P/NP grading only.)

Upper Division Courses

100. Embryology (4) I, Armstrong; II. The Staff; III. Armstrong, Natzie, Nuccitelli
 Lecture—4 hours. Prerequisite: Biological Sciences 1 and courses 2-2L; concurrent enrollment in course 100L strongly recommended. Events and mechanisms of embryonic development, including fertilization, morphogenesis, cell differentiation and organogenesis, with emphasis on vertebrates.

100L. Laboratory in Vertebrate Embryology (2) I, Armstrong; II, III. The Staff
 Laboratory—6 hours. Prerequisite: course 100 (concurrently). Comparative analysis of the embryonic development of vertebrates. (P/NP grading only.)

101. Experimental Analysis of Animal Development (3) III. The Staff
 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.

102. Senior Colloquium in Developmental Biology (3) II. Grey
 Lecture—1 hour; seminar—2 hours. Prerequisite: course 100 with a grade of B or better; consent of instructor. Analysis of major topics in developmental biology, including fertilization and activation of development, morphogenesis, cell differentiation and pattern formation. Limited enrollment.

105. Phylogenetic Analysis of Vertebrate Structure (5) I. The Staff
 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) II.**
 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) II.**
 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 (4) II. Grosberg
 Lecture—4 hours. Prerequisite: courses 2-2L; course 112L (concurrently); courses in systematics, ecology, and evolution recommended. Survey of the invertebrate phyla emphasizing aquatic forms and focusing on morphology, development, natural history, and phylogenetic relationships.

112L. Laboratory for Invertebrate Zoology (3) II. Grosberg
 Discussion—1 hour; laboratory—6 hours. Prerequisite: courses 2-2L; course 112 (concurrently). Field and laboratory experience with representative members of the invertebrate phyla discussed in the lecture course (Zoology 112). Emphasis on comparative morphology, natural history, ecology, and behavior of living invertebrates.

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. Natzie
 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. The Staff
 Lecture—1 hour; laboratory—6 hours. Prerequisite: Biochemistry 101A-101B. Courses 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 and the Staff; III, The Staff
 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), Leslie; II. Deamer
 Lecture—4 hours. Prerequisite: Chemistry 8B or 128C; introductory course in biochemistry 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) II. The Staff
 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.

134. Herpetology (3) III. Shaffer
 Lecture—2 hours; term paper. Prerequisite: courses 2-2L; course 148 recommended. The world-wide diversity of amphibians and reptiles with emphasis on behavior, ecology, functional morphology, and evolutionary history. Offered in odd-numbered years.

134L. Herpetology Laboratory (1) III. Shaffer
 Laboratory—3 hours; two weekend field trips. Prerequisite: courses 2-2L; course 134 concurrently. Diagnostic characteristics and functional attributes of amphibians and reptiles, emphasizing ecological, biogeographic and phylogenetic patterns. Field trips will acquaint students with techniques for identifying and studying amphibians and reptiles under natural conditions. Offered in odd-numbered years.

136. Mammalogy (2) I. The Staff
 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. The Staff
 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. Salt
 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. Salt
 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) III. Shapiro
 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** (4) II.
 Lecture—3 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.

***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 6B; 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. Anderson, 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 6B 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. The Staff
 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.

148. Animal Phylogeny and Evolution (4) II. 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.

***150. History of Biology and Medicine** (4) II.
 Seminar—3 hours; oral presentation; term paper. Prerequisite: senior standing in Zoology or related science; open to graduate students. Review of history of biology and medicine from ancient societies to the present day. Attention will be given the interaction of biology with other sciences, such as physics, chemistry, and geology, as well as its relationship to society. Offered in odd-numbered years.

155. Behavior of Animals (5) III. 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.

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.)

190. Undergraduate Seminar in Zoology (2) II. Shapiro; III. Deamer
 Seminar—2 hours. Prerequisite: upper-division standing in biological sciences or related discipline. Student reports on current topics in zoology, broadly construed, with emphasis on integration of concepts, synthesis, and state-of-the-art research approaches. Reviews of literature and reports of undergraduate research may be included. May be repeated for credit. (P/NP grading only.)

192. Internship (1-12) I, II, III. The Staff (Chairperson in charge)
 Laboratory—3-36 hours. Prerequisite: completion of 84 units and consent of instructor. Work-learn experience off and on campus in all subject areas offered in the Department of Zoology. Internships supervised by a member of the faculty. (P/NP grading only.)

194HA-194HB-194HC. Research Honors in Zoology (2) I, II, III. The Staff (Chairperson in charge)
 Laboratory—6 hours. Prerequisite: students majoring in Zoology who have completed 135 units and qualify for the honors program (as defined in the current catalog). Zoology majors pursue intensive research under guidance of a faculty adviser. Students are expected to complete the full three-quarter sequence culminating in the writing of an honors thesis. (Deferred grading only, pending completion of sequence.)

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)
 (P/NP grading only.)

Graduate Courses

200. Current Techniques in Cell Biology (2) I, Nuccitelli
 Lecture—2 hours. Current techniques used in cell biology research including microscopy, spectroscopy, electrophysiology, immunochemistry, histology, organelle isolation, calorimetry, tissue culture and gel electrophoresis. Lectures presented by experts on each technique, with emphasis on pitfalls to avoid when using the technique. (S/U grading only.) (Same course as Cell and Developmental Biology 200.)

200LA. Cell and Developmental Biology Laboratory (3) I, II, III. The Staff (Chairperson in charge)
 Laboratory—18 hours (five weeks only). Prerequisite: course 200 (may be taken concurrently). One five-week assignment in research laboratory of a Cell and Developmental Biology Graduate Group member. Individual research problems with emphasis on methodological/procedural experience and experimental design. (Same course as Cell and Developmental Biology 200LA.)

200LB. Cell and Developmental Biology Laboratory (6) I, II, III. The Staff (Chairperson in charge)
 Laboratory—18 hours (two five-week assignments). Prerequisite: course 200 (may be taken concurrently). Two five-week assignments in research laboratories of Cell and Developmental Biology Graduate Group members. Individual research problems with emphasis on methodological/procedural experience and experimental design. (Same course as Cell and Developmental Biology 200LB.)

***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.

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 106 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.

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. Offered in even-numbered years.

205. Pattern Formation (4) III. 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 cytoplasmic 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.
 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.

212. Topics in Invertebrate Evolution (2) I, Grosberg
 Seminar—2 hours. Prerequisite: graduate standing or consent of instructor and course 112-112L; courses in evolutionary biology, systematics, and ecology highly recommended. Advanced seminar that critically examines problems relevant to evolutionary patterns among the invertebrates. May be repeated for credit when topic differs. (S/U grading only.)

***222. Topics in Advanced Ecology** (2) I, Schoener
 Lecture—1 hour; seminar—1 hour. Prerequisite: Ecology 204 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.)

***225. Biology of Fertilization** (3) III. Grey
 Lecture—2 hours; term paper. Prerequisite: course 121A or the equivalent and consent of instructor. The morphology, physiology and biochemistry of gametes and the mechanism and consequences of their union. Offered in odd-numbered years.

226. Cell Biology of the Malignant State (1) I, Armstrong
 Lecture—2 hours (first five weeks of quarter). Prerequisite: course 100, and one course from 121A, 121B, 130 or Biochemistry 101A-101B or Physiological Sciences 101A-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. (S/U grading only.)

***228. Experimental Animal Ecology** (3) II. Salt
 Lecture—2 hours; 3 weekend field trips, 2 written critiques. Prerequisite: course in animal ecology. Discussion of means of generating ecological hypotheses and methods of testing those hypotheses. Topics will include analysis of field observation, experimental design in both field and laboratory, and interpretation of results. Limited enrollment.

***236. Muscle Physiology** (4) I, Baskin
 Lecture—2 hours; discussion—1 hour; term paper. Prerequisite: Biochemistry 101A-101B and Mathematics 16B or 21B; or consent of instructor. The physical and chemical aspects of muscle function.

240. Topics in Cell Biology (3) I, 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.

242. Research Conference in Cell Biology (1) I, Crowe; II, Deamer; III Natzle

Seminar—1 hour. Prerequisite: consent of instructor. Presentation and critique of faculty and graduate student research in cell biology. May be repeated for credit. (S/U grading only.)

243. Topics in Cellular and Behavioral Neurobiology (2) III. Mulloney

Seminar—2 hours. Prerequisite: consent of instructor. An advanced examination of several current problems in neurobiology. Topics will vary in different years; may be repeated for credit. (S/U grading only.)

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) III. Leslie

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, Nuccitelli; II, Armstrong; III, the Staff

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.)

270. Research Conference in Evolutionary Biology (1) I, II, III. Shaffer, Grosberg

Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and evaluation of current literature and ongoing research in evolutionary biology. (S/U grading only.)

283. Neurobiological Literature (1) I, II, III. Anderson, Mulloney

Seminar—1 hour. Prerequisite: consent of instructor. Critical presentation and analysis of recent journal articles in neurobiology. (S/U grading only.)

287. Seminar in Animal Behavior (2) II. Stamps

Seminar—2 hours. Prerequisite: consent of instructor. Reports and discussion on the principles and recent developments in invertebrate and vertebrate animal behavior.

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. Nuccitelli

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. Erickson

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) II. Salt

Seminar—3 hours. Prerequisite: course 125 and graduate standing. Readings and discussions of advanced topics in the population and community ecology of animals.

295. Seminar in Marine Invertebrate Ecology (2) II, Quinn

Seminar—2 hours. Prerequisite: course 112 and consent

of instructor. Reports and discussion on current topics in marine invertebrate ecology. Open to qualified undergraduates.

296. Seminar in Geographical Ecology (2) II. Shapiro

Seminar—2 hours. Prerequisite: course 125 or 148 or Genetics 103 or consent of instructor. Recent developments in theoretical and experimental biogeography, historical biogeography and related themes in systematics, the biology of colonizing species, and related topics. (S/U grading only.) May be repeated for credit.

298. Group Study (1-5) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

299. Research (1-12) I, II, III. The Staff (Chairperson in charge)

(S/U grading only.)

Professional Course

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.)

APPENDIX

OTHER USEFUL PUBLICATIONS

Undergraduate Admissions Circular

A complete statement of the University's requirement 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.)

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.)

Graduate School of Management Bulletin

Admission requirements, description of academic programs, courses of instruction, faculty, and general information.

Graduate School of Management, 308 Voorhies Hall, 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 30 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 Freeborn. (No charge. Available by mail.)

Venture

University Extension quarterly catalog. Complete information about Unex courses, including times and location.

University Extension, 414 Surge IV. (No charge.)

City of Davis Information

Chamber of Commerce, 228 B Street, Davis, CA 95616.

GLOSSARY

- Academic Senate** The faculty governing body of the University. Consists primarily of the regular faculty and certain administrative officers. Determines conditions for the admission of students and for granting certificates and degrees, develops educational policy, and authorizes and supervises all courses in the University.
- Academic year** Starts at the beginning of the Fall Quarter, ends at the close of the Spring Quarter; does not include summer sessions.
- Add/Drop Petition** A petition used when you want to add, change or drop a course to your study list. (Sometimes referred to as an Add/Drop card.)
- 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 term. (A student returning from PELP is also considered continuing.)
- 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.
- Directed group study** A course set up on a one-time basis for a group of students in a subject area where no regular courses have been established.
- Discipline** A branch of knowledge or teaching. Typically refers to an area of study or a major field.
- Enrollment** Signing up for a class, either through preenrollment or the submission of an Add card; the *fact* of being officially enrolled 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 by dividing the total number of grade points accumulated by the number of course credits taken. Courses taken P/NP or S/U, or outside of the UC system are not considered (exception, see Incomplete or I grade).
- 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 study** A course arranged for an individual student who shares with an instructor an academic interest which cannot be accommodated within formal course structure.
- Independent Study Program** A program intended to provide an opportunity for upper division students to pursue a special interest for a full quarter.
- 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 83.9 or fewer 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 included 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** A plasticized identification card with a photo provided to each new student. Upon payment of fees a validation sticker is issued to be affixed to this card. The then validated card serves to identify the carrier as a UCD student. There is a replacement fee if lost.
- Prerequisite** A necessary condition for enrollment in a course or a major. Prerequisites for courses usually consist of a previous course or courses in a related subject and/or the instructor's permission. Prerequisites are indicated in the course descriptions.
- Professional school student** A student enrolled in the School of Law, Management, Medicine, or Veterinary Medicine.

- Probation** An indication that performance is below standard because of academic deficiencies; a trial period in which a student is permitted to redeem failing grades or deficient units.
- Quarter** A subdivision of the academic year at UCD, consisting of three 10-week terms (Fall, Winter, and Spring Quarters). The two 6-week summer sessions provide a quarter's work in a more concentrated format, but are not considered regular quarters. (Attendance at both summer sessions, however, may count as one quarter in residence.)
- Quarter units** Academic work at the University is measured by quarter units of credit which determine the amount of time a student has formally devoted to a given subject. To convert these units to semester units multiply by 2/3; from semester to quarter units multiply by 3/2.
- RA (Research Assistant)** RA's are graduate students who do research on a part-time basis while pursuing their degrees. They are selected, trained, and supervised by senior faculty members in departments.
- RA (Resident Adviser)** RA's are student staff members of the Student Housing Office who help plan, coordinate, and conduct educational and social programs to meet residence hall students interests and needs.
- RD (Resident Director)** RD's are full-time professional staff members of the Student Housing Office. They help residence hall students with academic, housing, and personal problems, and supervise and train student Resident Advisers.
- Registration** The payment of fees for a term or summer session. Registration also typically involves giving address information and having a photo ID made. By registering, the student informs the University of intent to begin or continue attendance. (Also, see Enrollment.)
- 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. (See also Semester.)
- 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) or semester (fall 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 84.0 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.

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 residence of each student for fee assessment purposes.

Students who have not been 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.

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 upon admission to the University of California, an adult student, other than an adult alien present in the United States under the terms of a nonimmigrant status which precludes the alien from establishing domicile in the U.S., 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 the student's stay in California.

Relevant indicia which can be relied upon to demonstrate one's intent to make California the permanent residence include, but are not limited to, the following: registering and voting in California elections; designating California as the permanent address on all school and employment records, including military records if one is in the military service; obtaining a California driver's license or California Identification Card, if a non-driver; obtaining California vehicle registration; paying California income taxes as a resident, including taxes on 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 places 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. A minor, except a minor alien present in the United States under the terms of a nonimmigrant status which precludes the minor alien from establishing domicile in the U.S., 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

A student seeking resident reclassification for tuition purposes must petition at the Office of the Registrar. Documentation of residence (driver's license, voter registration receipt, etc.) will be required at that time. Financial independence will be included among the factors considered for students classified nonresident seeking reclassification to resident for tuition purposes. Financial independence will not be considered for graduate students who are teaching assistants, research assistants or teaching associates employed on a 0.49 percent or more time basis for the term for which reclassification is sought. 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.

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, Berkeley, California 94720, within 90 days after notification of the final decision by the Residence Deputy.

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.

Exceptions

1. A minor who is a U.S. citizen or eligible alien and 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. A student who is a U.S. citizen or eligible alien and who is a minor or 18 years of age may be eligible for resident status if he or she can show that he or she has been totally self-supporting through employment and actually present within California for the entire year immediately prior to the residence determination date and has demonstrated the intent to make California his or her permanent home.

3. A student who is a U.S. citizen or eligible alien 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 exemption 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 continue receiving the exemption 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. 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.

7. The dependent children and spouses of full-time University of California employees whose permanent assignment is outside California may be entitled to resident classification.

Waivers Of Nonresident Tuition

To the extent funds are available, nonresident tuition waivers may be granted to a spouse and unmarried dependent children under age 21 of a University faculty member who is a member of the Academic Senate. Inquiries regarding this waiver 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.

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 recordkeeping system was established prior to January 1, 1975 pursuant to the authority of The Regents of the University of California under Art. IX, Sec. 9, of the California Constitution.

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 (TDD) 752-7320.

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.

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 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 UC policies may be obtained at the Office of Student Judicial Affairs.

Categories of *personally identifiable information* designated by the campus as public information are: name, address (campus and/or permanent), telephone numbers, date and place of birth, major field of study, dates

of attendance, degrees and honors received, the most recent previous educational institution attended, participation in officially recognized activities, including intercollegiate athletics and the name, weight, and height of the participants on intercollegiate University athletic teams provided, however, that address and telephone numbers are not public information with respect to interns, residents and fellows and that with respect to these students, public information also includes primary hospital assignment, field of residency training, and name of medical school awarding the M.D. degree.

Students who desire to withhold their addresses and telephone listings may so indicate by the last day of registration on the Student Data Card included with the registration materials. Students who desire to withhold their entire record must file a form available at the Registrar's Office.

Students availing themselves of this right should understand what the consequences of this action may be. For example, 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 any time.

PROPORTION OF UCD GRADUATES FINDING WORK IN THEIR FIELDS OF CHOICE¹

The percent of UCD alumni whose full-time job is in the field of their choice is shown by field of study. Figures do not include the 10 percent of graduates who had not decided on a career field at the time of the survey.

Field of Study ²											
Animal Science	Applied Economics	Behavioral Science	Food Science	Plant Science	Bio-science	Resource Science	Engi-neering	Humanities	Physical Science	Social Science	Total Percent
—proportion (%) finding work in field of choice—											
70	80	76	76	78	62	72	96	60	80	55	73

¹Source: A 1984 survey of 1983 UCD graduates conducted by Student Affairs Research and Information, University of California, Davis.

²Fields of Study are groups of related undergraduate majors; for example, "Animal Science" would include such majors at UCD as Animal Science, Avian Sciences, and Wildlife and Fisheries Biology.

RETENTION DATA¹ AND GRADUATION RATES AT UCD

Freshmen

(Retention and graduation rates through Spring 1987 for regularly admissible undergraduates entering UCD as freshmen.)

Fall Quarter of Initial Enrollment:	Number of Students	Percent Enrolled 4 Quarters	*Percent Graduating In	
			12 Quarters	15 Quarters
1977	2,139	86%	35%	63%
1978	2,273	88%	35%	65%
1979	2,570	88%	34%	65%
1980	2,884	89%	35%	66%
1981	2,627	89%	34%	67%
1982	2,392	91%	38%	67%

Transfer Students

(Retention and graduation rates through Spring 1987 for regularly admissible undergraduates transferring to UCD as juniors.)

Fall Quarter of Initial Enrollment:	Number of Students	Percent Enrolled 4 Quarters	*Percent Graduating In	
			6 Quarters	9 Quarters
1979	723	84%	39%	71%
1980	652	86%	37%	72%
1981	546	86%	42%	75%
1982	609	85%	37%	68%
1983	611	88%	36%	73%
1984	703	89%	34%	65%

*These are not necessarily quarters of continuous enrollment. Students may drop out or go on Planned Educational Leave for a quarter or longer, and then resume their studies. (There are three quarters in each academic year.)

¹Source: Student Affairs Research and Information, University of California, Davis (January 1988).

AVERAGE MONTHLY SALARY OFFERED TO GRADUATES WITH BACHELOR'S, MASTER'S, AND DOCTORATE DEGREES¹

Field of Study:	Average Monthly Salary		
	Bachelor's	Master's	Doctorate
Engineering	\$1,973–\$2,568	\$2,413–\$2,957	\$3,336–\$3,965
Humanities/ Social Sciences	1,688–1,823	1,833–1,887	—
Allied Health/ Life Sciences	1,818–2,040	—	—
Physical Sciences	2,001	—	3,345*

*Physics only.

¹Source: College Placement Council Salary Survey (July 1987).

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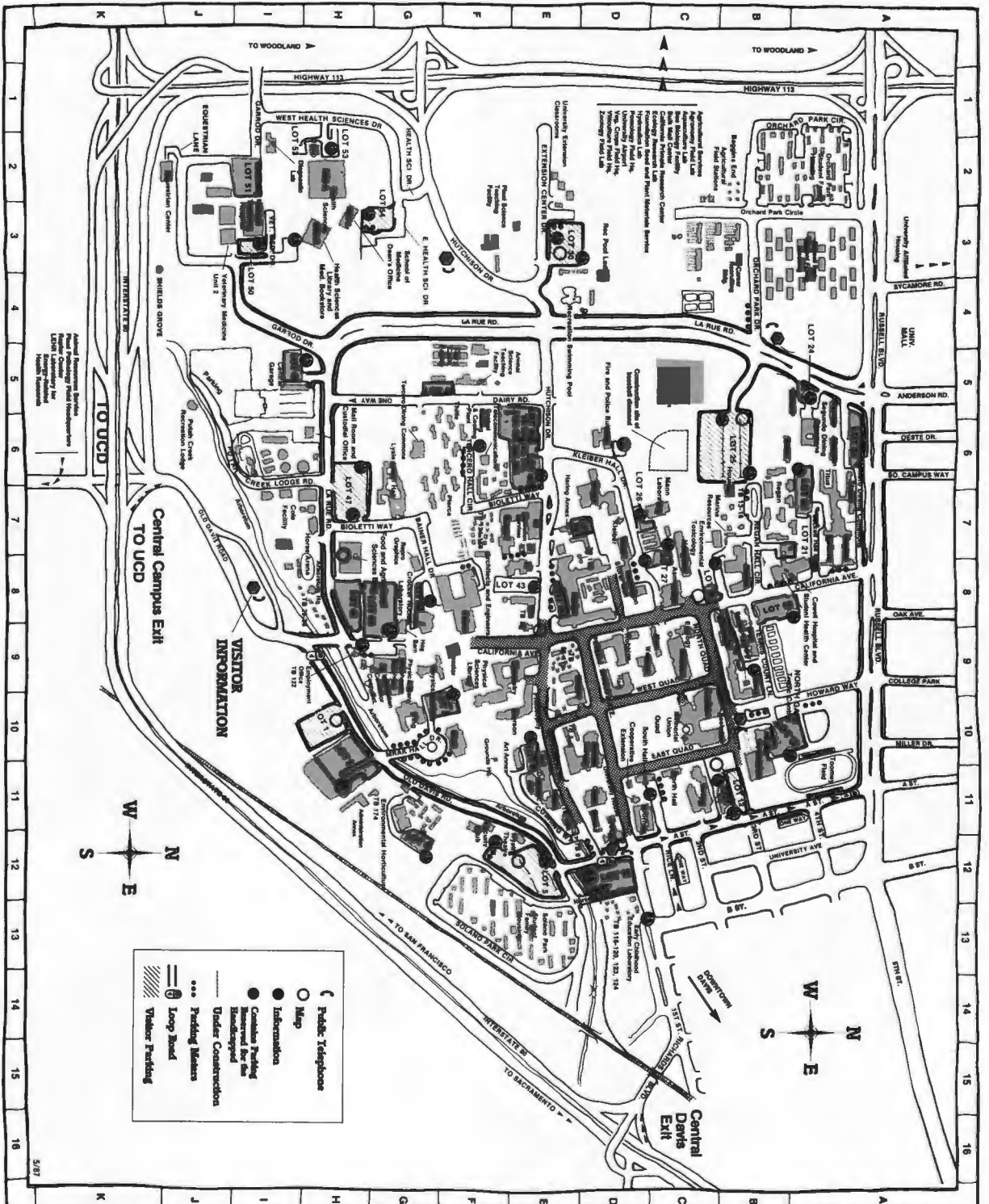
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Marine Resources Laboratory	A-6
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UC DAVIS



Music Building	E-11	Plant Science Teaching Facility	F-3	Roesler Hall	B-2, F-13	Temporary Buildings 134-158	F-7	Classrooms	E-2
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VISITOR INFORMATION

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- Information
- Campus Parking
- Under Construction
- Parking Signs
- Loop Road
- Visitor Parking



ON THE COVER

George Longfish, **Goodbye Norma Jean, The Chief Is Dead** Media: Acrylic and mixed media. Size: 7'h x 5'w



THE ARTIST

George Chester Longfish

Born:

1942 Ontario, Canada

Education:

1970 BFA School of the Art Institute of Chicago

1972 MFA School of the Art Institute of Chicago

TEACHING:

1971-72 Little Big-horn High School
Chicago, Illinois

1972-73 University of Montana, Missoula

1973-88 University of California, Davis

SELECTED SOLO EXHIBITIONS:

1971 Hunt-Henry Studio, Chicago, IL

1972 Gallery of Fine Arts, University of Montana, Missoula.

1979 Walter Kelly Gallery, Chicago, IL.

1980 Washington State University,
Pullman, WA.

1982 P.M. Stein Gallery, New York, NY.

1982 Pence Gallery and Coleman Fine Arts, Davis, CA.

1983 College of the Redwoods Gallery,
Eureka, CA.

1984 Bernice Steinbaum Gallery, New York, NY.

1984 Crocker Art Museum, Sacramento, CA.

1984 Museum of the Plains Indian and Crafts Center, Browning, MT.

1985 Yuba College (Woodland Center), Woodland, CA.

1985 American Indian Contemporary Arts Gallery, San Francisco, CA.

1986 Enthos Gallery, Santa Fe, NM.

1986 Robert Else Gallery, California State University, Sacramento, CA.

1988 American Indian Contemporary Arts, San Francisco, CA.

PUBLICATIONS

Longfish, G., & Randall, J. Summer 1982. *New ways of old visions: The evolution of contemporary Native American art.* *Artspace: Southwestern Contemporary Arts Quarterly*, 6(3), 24-27.

Longfish, G.C., & Randall, J. *Contradictions in Indian Territory. Catalog — Indian Art Exhibit, Oklahoma State University, October 1983.*

Longfish, G.C., & Randall, J. *Made by choice. Catalog — The Extension of Tradition, Crocker Art Museum, July 12, 1985.*



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